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KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ę	befall, elope
ë	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or H	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
į	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn'yŏn), *piñon* (pēn'yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ṫh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure

' (prime), " (secondary) accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

Conshohock'en, Pa., a town of Montgomery County, on the Schuylkill River and Canal, and on the Pennsylvania and the Philadelphia & R. R.R.'s. It has a number of manufacturing interests, including blast furnaces, rolling-mills, woolen- and cotton mills, and pottery works. Pop. (1900) 5,762.

Considérant, Victor-Prosper, vēk-tōr-prōs-pār kôn-sē-dā-räṅ, French Socialist: b. Salins 12 Oct. 1808; d. 27 Dec. 1893. After being educated at the Polytechnic School of Paris, he entered the army, which, however, he soon left to promulgate the doctrines of the Socialist Fourier. On the death of his master (1837), Considérant became the head of his school, and undertook the management of the 'Phalange,' a review devoted to the spread of their opinions. Having gained the support of a young Englishman, Mr. Young, who advanced the money, Considérant established, on a large estate in the department Eure et Loire, a Socialist colony or Phalanstere; but the experiment failed, and with it the 'Phalange' fell to the ground. Thereafter he continued to promote his views in the 'Democratié Pacifique.' Among his numerous writings, the chief is the 'Destinee Sociale,' dedicated to Louis Philippe. In 1849 Considérant was accused of high treason and compelled to flee from France. Near San Antonio, Texas, he founded a Socialist community, *La Réunion*, which flourished for a time, but afterward came to nothing and he returned to France in 1869.

Consistory, in ecclesiastical usage, means a court or council of ministers and Church officials or dignitaries, for transaction of business relating to the Church. In the Roman Catholic Church the Consistory by eminence is the whole college of the cardinals, which is, so to speak, the Pope's senate, assembled at stated or occasional times to deliberate questions of Church administration. It is usually presided over by the Pope in person, but often by his delegate; the stated meetings are twice a month; the sessions are secret usually, but often they are public or sémi-public, Church dignitaries of rank inferior to the cardinalate being admitted. In the Church of England every bishop of a diocese has a consistorial court for determination of ecclesiastical causes arising within his jurisdiction. In Presbyterian and other Protestant communions the Consistory is an assembly or council of ministers and elders, deliberative and judicial.

Consolacion Del Sur, kōn-sō-lä-thē-ōn' dĕl soor, Cuba, the name of a district and a city in the eastern central part of Pinar del Rio province. It has railroad communication with Havana. Pop. of the district about 17,000; of the city 3,062.

Consolato Del Mare, kŏn-sō-lä'tō dĕl mä'rĕ. See Commercial Law.

Consol'idated Fund, a fund, which now receives the produce of nearly all the taxes and other sources of revenue of Great Britain and Ireland, was formed in 1787 by the union of certain separate funds by Act 27 George III., cap. xiii. On the union of the exchequer of Great Britain and Ireland, in 1816, the fund was augmented with the separate revenue of the Irish exchequer, and the charges hitherto made upon that exchequer were thrown upon it. The fund is pledged for the payment of the interest of the whole of the national debt of Great Britain and Ireland, and after defraying the specific charges assigned to it, the surplus is applied indiscriminately to the public service.

Consols, or **Consolidated Annuities,** a public stock forming the greater portion of the national debt of Great Britain. It was formed in 1751 by an act consolidating several separate stocks bearing interest at 3 per cent into one general stock. At the period when the consolidation took place, the principal of the funds united amounted to £9,137,821; but through the addition of other loans it has increased so much that now, after considerable reductions, it still amounts to more than half of the national debt.

Con'sonance, in music, is the effect of two or more sounds heard at the same time, which satisfies the ear. Consonances have two forms (major and minor), as the third and sixth, are called "imperfect"; those having only one form, as the fifth and octave, are called "perfect." See Concord.

Con'sonant, a letter, which cannot be sounded, or only imperfectly, by itself and for utterance requires a vowel to be added. Conso-

nants are either liquids or mutes. The liquid consonants, l, m, n, r, are pronounced easily and with only a slight contact of the articulating organs. The mute consonants, those formed by such a position of the vocal organs as stops the emission of sound entirely, are b, d, g hard, p, k, and t. The two sibilants, s and z, usually numbered with consonants, are a class apart, for neither for initial nor for continued utterance do they need to be combined with a vowel; hence, like the liquids and v, they are semivowels.

Consort, he, she or that which shares the same lot with another; a companion; a partner; an intimate associate; a wife or husband; applied in a modern sense chiefly to persons of royal degree or position, in countries where women are able to reign; as, a queen consort; a prince consort; that is, the wife of a reigning monarch, or spouse of a queen-regnant. It is also applied to a ship sailing in company with another.

The queen consort, the wife of the reigning king, is, in all legal proceedings, looked upon as a single, not as a married woman. She may purchase and convey lands, grant leases, and do other acts of ownership without the intervention of the king. She may also sue and be sued in her separate person, and possesses courts and officers distinct from those of the king. She pays no toll, and is free from any fine which a court could impose upon women in general; but in other respects she is on a similar footing with the other subjects of the king. In her life and person, however, she enjoys the same protection as the king, it being high treason to design the death of either. The husband of a queen-regnant is not endowed by the constitution with any distinctive rights or privileges. All his privileges and honors, therefore, must emanate from the crown, under the form of a warrant, grant, or patent, or else be conferred by act of Parliament introduced after a royal message on the subject. Up to 1857, when the title of Prince Consort was bestowed upon him by letters patent, the late Prince Albert possessed no distinctive title and no place in court ceremonial but such as was accorded to him by courtesy.

Conspiracy, legally defined, "a combination by two or more persons, by some concerted action, to accomplish an unlawful purpose, or to accomplish a purpose not in itself unlawful, by unlawful means." The common law recognizes as an offense the agreement between the conspirators to do an unlawful act, and no overt act is necessary for the completion of the crime; but changes have been made in this holding of the common law by the laws of several of the States and by Federal legislation in the United States. Where the changes have been made it has been declared that an overt act was necessary to make the conspiracy a crime. Conspiracies are ranked as misdemeanors, except such as by acts of legislation have been declared statutory conspiracies, and punishable as such, and they are ranked as felonies. Consult Bishop, 'New Commentaries on the Criminal Law.'

Constable, kun'sta-bl, **Archibald**, Scottish publisher: b. Carnbee, Fifeshire, 24 Feb. 1774; d. Edinburgh 21 July 1827. He was the original publisher of the 'Edinburgh Review,' the poems of Sir Walter Scott, the 'Waverley Novels,' and other well-known works. In 1826, however, the firm was compelled to stop payment, with liabilities exceeding $1,250,000. Sir Walter Scott, who was heavily involved, practically sacrificed his life in the endeavor to meet his creditors. Constable himself did not long survive his misfortunes.

Constable, Archibald, and His Literary Correspondents, a work by Thomas Constable. (1873.) It is the story of the Edinburgh publishing house which established the 'Edinburgh Review'; initiated the publication of cheap popular volumes of literature, art, and science; and by a bold liberality in payment of authors, with remarkable sagacity in judging what would succeed with the public, virtually transformed the business of publishing. In October 1802 the first number of the 'Edinburgh Review' appeared. The generous scale of payment soon adopted,— 25 guineas a sheet,— startled the trade, and greatly contributed to make Constable the foremost among publishers of his day.

Constable, Henry, English poet: b. Newark, England, 1562; d. Liège, Belgium, 9 Oct. 1613. His chief work was his book of sonnets, 'Diana,' published in 1592, when few sonnets in the Italian form had been written. He was probably the author also of the 'Forest of Fancy' (1579), attributed to Chettle. Suspected of treason against Elizabeth, he was compelled to leave the country, and on his return in 1604 was confined in the Tower for a short time. His lyric 'Diaphenia' and his pastoral 'Venus and Adonis' take a high place in contemporary song.

Constable, John, English landscape painter: b. East Bergholt, Suffolk, 11 June 1776; d. London 30 March 1837. His father was a wealthy miller, and was at first desirous that his son should enter the Church, and then, on finding him disinclined to this career, proposed that he should follow his own business. At the latter employment he continued for several years, but his favorite pursuit was painting, and in this he used to occupy his leisure hours. After considerable objection on the part of his father, he entered as a student of the Royal Academy in 1799. For many years his progress as an artist was extremely slow, and it was not until 1814, 12 years after he had begun to send pictures to the exhibition, that he succeeded in getting any of them sold. In 1819 his 'View on the River Stour' attracted much attention, and procured him admission as an associate of the Academy. From this period his reputation widely extended itself, both over Great Britain and the Continent, and for some of his works exhibited at the Louvre he received a gold medal from the king of France. Constable's pictures are remarkable for the truth and vividness with which country scenes and natural phenomena are represented. Fuseli said of them that they made him call for his umbrella; and a French critic declared that his leaves and grass were bespangled with morning dew. Among the finest of his works are: 'A View of Salisbury Cathedral'; 'The Cornfield'; 'The Lock'; and 'The Valley Farm.' Lately several good examples of Constable's art have been added to the Louvre, and the late Henry Marquand presented two fine pictures by him to the Metropolitan Museum of Art in New York. See: Leslie, 'Memoirs of Constable' (1845); Wedmore, 'Studies in Eng-

lish Art' (1876-80); Brock-Arnold, 'Gainsborough and Constable' (1881); Chesneau, 'La Peinture Anglaise' (1882); Muther, 'History of Modern Painting' (1896).

Constable (Lat. *comes stabuli,* count of the stable = master of the horse). 1. A great noble under the later Roman empire, and so down through the Middle Ages; usually the commander-in-chief of the army; in France also of the navy, and the chief subject in the state, whence Richelieu abolished the office in 1627. Napoleon revived the title but not the authority, and it lapsed with him. In England the lord high constable and the earl marshal held the courts-martial and courts of chivalry; but Henry VIII. left the office unfilled, and it is only revived temporarily for great pageants. There were constables who were wardens of castles, and whose office is still existent, hereditary or appointive. 2. In England, a petty constable was the chief parish officer for keeping the peace, but is now mostly supplanted by the police. 3. In the United States, outside of cities and incorporated villages, the constable is still the chief conservator of the peace. The office was borrowed from England, and in colonial times was of high importance, including functions now assigned to various other officers. In New England he was appointed by the selectmen, in Virginia by the hundred, in other provinces or States chosen by the town. He not only made arrests, imprisoned, had right of search and executing processes, etc., but he was often tax collector, overseer of the roads, and even petty judge, and gave notice of town-meetings. There was no legally defined scope of his duties, each community deciding them for itself, but the place was always considered one of power and dignity. Philadelphia and New York had high constables, the latter up to about 1830, when his functions were given to the chief of police. The office of "constable of the commonwealth" has also been created in some States.

Con'stance (Ger. *Constanz,* or *Konstanz,* ancient CONSTANTIA), Germany, city and lake-port in the grand-duchy of Baden, occupying the only territory belonging to Germany on the south side of the Lake of Constance, at the place where that lake communicates with the arm known as the Untersee, "Lower Lake," and where the Rhine issues from it; 35 miles northeast of Zurich. The chief edifices are a cathedral, the Kaufhaus, in which the famous Council of Constance sat from 1414 to 1418, and which deposed three anti-popes, and condemned Huss and Jerome of Prague; an ancient palace; a grand ducal residence. The city has manufactories of cotton goods, carpets, chemicals, and sacking. Constance is said to have been founded in 378 A.D. by Constantius Chlorus as a bulwark against the Alemanni. In the Middle Ages, when it reached the height of its prosperity (at the time of the Council it was able to receive 20,000 visitors), it was frequently called Kostnitz. It was annexed to the Austrian dominions in 1549, and to Baden in 1805. Pop. 16,500.

Constance, General Council of, the 16th ecumenical council of the Church, was held at Constance in Switzerland; it was presided over by Pope John XXIII., in its opening session 5 Nov. 1414, and was dissolved in its 45th session 1418. It was called for the purpose of restoring peace to the Church, which was troubled with schisms owing to the rivalry of three claimants of the papal throne. There was Balthasar Cossa, styled John XXIII.: his title seemed to be sound in point of law, but the man was eminently unfit for the office; then there was Petrus de Luna, styled Benedict XIII.: he was a Spaniard, but was chosen by the French cardinals: his style Benedict XIII., was formally disallowed when the Pope, Vincenzo Marco Orsini, who at first assumed the style of Benedict XIV. (1724), afterward changed that to Benedict XIII.; and there was Angelo Corario, styled Gregory XII.: both of these had been condemned as perjured men, heretics, and schismatics, by the Council of Pisa, which council "deposed" them; but they still claimed papal honors. Besides the healing of these schisms, the Council was called to take measures for repression of Wiclefism in England and analogous heresies in Bohemia and elsewhere. Also the Council was to consider the ways and means of effecting a "reformation of the Church in head and members." In the Council were some of the eminent divines of the time, among them Pierre d'Ailly and Gerson, chancellor of the University of Paris, both sturdy advocates of reform: there were also in the Council bishops representing the churches of England and Ireland. John Huss, chancellor of the University of Prague, summoned to plead in the Council to the charge of maintaining the Wiclefite heresies, attended, having come under a safe-conduct of the Emperor Sigismund. The Council condemned the doctrines of Huss and ordered him to be given up to the civil power, to be dealt with according to the laws: he perished at the stake. Memorable among the acts of this Council is its decision of a question submitted to the fathers regarding the succession to the sovereignty of the margraviate of Brandenburg. The Council recognized the superior validity of the claim of Conrad of Hohenzollern; from him is sprung the royal line of Prussia. The Council in the 12th session 29 May 1415 published a decree deposing John XXIII., who after a while formally resigned. In the 14th session Gregory XII. (Corario) gave in his resignation. Petrus de Luna (Benedict XIII.) refused to resign: but being no longer sustained by the king of Spain, he was simply ignored, and Cardinal Otto Colonna was elected Pope 11 Nov. 1417 under the style of Martin V. The schisms caused by the rival popes were ended. After a few reformatory measures, quite inadequate for the needs of the situation, were enacted, the Council was dissolved 22 April 1418.

Constance, Lake (anciently LACUS BRIGANTINUS; German *Boden See*), in central Europe, forming a common centre, in which Switzerland, and the territories of Baden, Würtemburg, Bavaria, and Austria meet. It lies between lat. 47° 28′ and 47° 50′ N.; and lon. 9° and 9° 42′ E.; length, northwest to southeast, 40 miles; greatest breadth, about 9 miles; area, 200 square miles; greatest depth, which is between Friedrichshafen and Rorschach, 964 feet; 1,283 feet above sea-level. At its northwest extremity the lake divides into two branches or arms, each about 14 miles in length; the north arm is called the Überlingen Lake, after the town of Überlingen, on its north bank; the south branch the Zellersee or Untersee. The Rhine enters the lake at Rheineck, at its southeast extremity, and leaves

it at Stein, at its northwest termination. Various other smaller rivers empty themselves into it. The lake, the waters of which are of a dark-green hue and very clear, are subject to sudden risings, the causes of which are unknown. In 1770 it rose in one hour from 20 to 24 feet above the ordinary level. It freezes in severe winters only. It is frequented by numerous aquatic birds, and contains a great variety and abundance of fish, including salmon, salmon-trout, pike, and carp. The traffic on it is considerable, although its navigation by sailing vessels is rendered dangerous by sudden and violent squalls. Steamers ply on the lake between Constance and various points on its shores. The land near is either flat or gently undulating, and fertile, and is covered with corn-fields, orchards, and gardens, interspersed with ruined castles, and other remains of the Middle Ages, and with numerous towns and villages, producing altogether a very pleasing and striking effect.

Constance Falcon, or **Phaulkon,** Greek political adventurer of the 17th century. His proper name was Constantine, and he was born in the island of Cephaloma. Having secured the favor of the king of Siam he undertook the project of introducing Christianity among the Siamese, and induced the king of Siam to send an embassy to Louis XIV. The ambassadors died on the route; but the French monarch, hearing of the scheme, sent two envoys, with some Jesuits, to Siam. French troops were also introduced into the country. These circumstances aroused the jealousy of the native princes and nobility, the result of which was a conspiracy which terminated in the dethronement of the king and the death of Constance, who was beheaded.

Constans (kŏn'stănz), **Flavius Julius,** Roman emperor: b. about 320 A.D.; d. in Gaul 350 A.D. He was a son of Constantine the Great, and divided the empire after the death of his father with his brothers, Constantine II. and Constantius II., receiving for his share Illyricum, Italy, and Africa. Constantine, who invaded his provinces, having been slain in the battle of Aquileia, Constans became emperor of the whole West. He was weak, profligate, and rapacious. His misrule caused an insurrection in Gaul under Magnentius; he fled to Spain, but was overtaken at the foot of the Pyrenees by the soldiers of the usurper, and slain. Constans protected the creed of Nice against the Arians and the Donatists, and closed the pagan temples.

Constans, Jean Antoine Ernest, zhŏñ äṅ-twan ĕr-nā kŏn-stañ, French politician: b. Béziers 3 May 1833. He was professor of law at Toulouse, was a republican member of the Chamber of Deputies in 1816; minister of the interior 1880–2; minister to China 1885–7, and governor general of Indo-China 1887–8. He was elected senator in 1889, and as minister of the interior 1889–92, actively contributed to the overthrow of Boulangerism.

Constant, Jean Joseph Benjamin, zhŏn zho zĕf bĕ-ṅ-zhĕ-mäṅ, French portrait painter: b. Paris 10 June 1845; d. there 26 May 1902. He studied in the École des Beaux Arts and under Cabanel. He has exhibited with growing distinction, at successive salons, from that of 1869, with his 'Hamlet,' his 'Samson' in 1872, his 'Scenes from Algiers' in 1873–4, his great historical painting of 'Mohammed II. in 1453' in the Exposition of 1878, and in 1885 a large Oriental subject, as melodramatic as possible, with splendid rendering of the human figure and strong effects of color. Other noted canvases by him are 'Le Roi du Desert'; 'La Tigre Favori'; and portraits of Mrs. Walters; Madame Calvé; Queen Victoria, exhibited in the Salon of 1901; Queen Alexandra; and De Bowitz. He was the fashionable artist of his time in Paris and London. His noble picture of 'Justinian' is in the Metropolitan Art Museum, New York. He was decorated with the Legion of Honor in 1878.

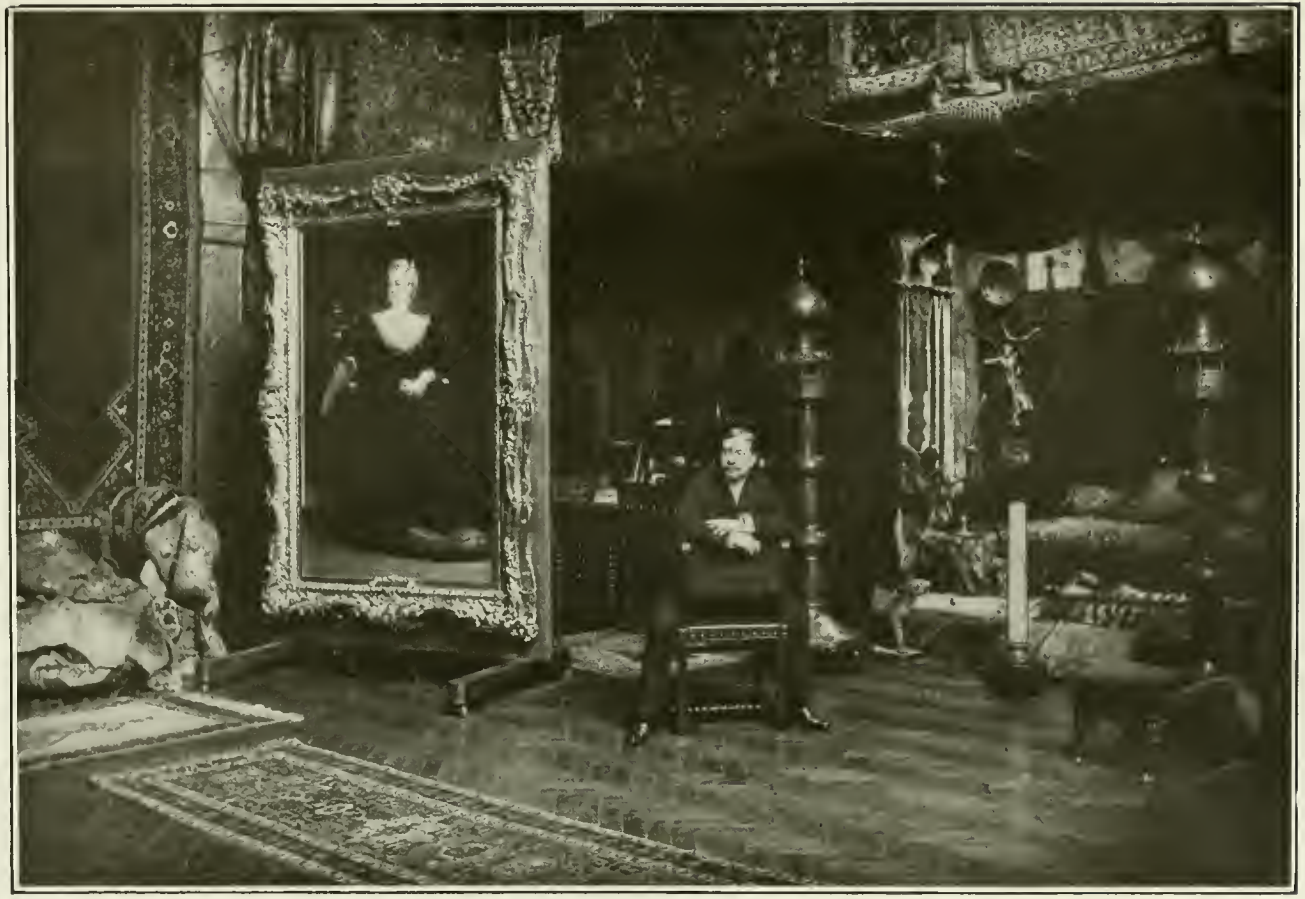
Constant de Rebecque, Henri Benjamin, ŏñ-rē boṅ zhä mäṅ kŏn-stan de re-bek, French publicist: b. Lausanne, Switzerland, 23 Oct. 1767; d. Paris 8 Dec. 1830. A member of the Revolutionary Tribunate, he was banished by Napoleon, and later by the Bourbons for accepting Napoleon. His chief works are: 'Cours de politique constitutionelle' (1818–20); 'Religion Considered in its Source, Its Forms, and Its Developments' (1823–5); 'Roman Polytheism'; and a romance, 'Adolphe' (1816).

Constan'tia, a district of Cape Colony, in South Africa; on the eastern and northeastern slopes of Table Mountain range, and distant from Cape Town seven miles. Constantia consists of only three estates, High, Great, and Little Constantia, which have long been famed for the quality of the wines produced upon them. The wines are sweet wines of delicious aroma, both red and white.

Constantin, kŏñ-stäṅ-tăṅ, **Abraham,** Swiss painter on porcelain: b. Geneva 1785; d. after 1851. His first work, a copy of Raphael's 'Madonna della seggiola,' was executed for the Empress Josephine. He afterward spent many years in Italy in close study of the works of Raphael, of whose style he became a successful imitator. In 1832 he was commissioned by Louis Philippe to make copies of Raphael's chief works in the Vatican, in the execution of which he carried the art of enamel painting to a perfection never before attained. The 'Transfiguration' alone occupied him a year. He has also made copies of the masterpieces of Titian, Correggio, and others, and in a few instances has attempted original compositions and portraits from life, which are highly prized. His best works are in the museum at Sèvres, and at Turin. Constantin made some valuable discoveries in the mechanical processes of his art, particularly with reference to the effect of burning upon the colors.

Constantine (kŏn'stăn-tīn) **I.,** Pope. He was elected in 708, and died in 714. There was also an anti-pope of this name, who usurped the holy office in 767.

Constantine I., Flavius Valerius Aurelius Constantinus, called the GREAT, Roman emperor: b. Rome 27 Feb. 274; d. Nicomedia 22 May 337. He was the son of the Emperor Constantine Chlorus, and after the death of his father was chosen emperor by the soldiery, in the year 306. Galerius was very unwilling to allow him the title of AUGUSTUS, and gave him that of CÆSAR only. Constantine, however, took possession of the countries which had been subject to his father, namely, Gaul, Spain, and Britain. He overcame the Franks, who had formerly



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JEAN JOSEPH BENJAMIN-CONSTANT.

overrun the territory of Gaul, made prisoners of two of their leaders, followed them over the Rhine, surprised and defeated them. He then directed his arms against Maxentius, who had joined Maximian against him. In the campaign in Italy he saw, it is said, a flaming cross in the heavens, beneath the sun, bearing the inscription, "*In hoc signo vinces*" (Under this sign thou shalt conquer). He accordingly caused a standard to be made in this form, which was called the *labarum*. Some days after this he vanquished the army of Maxentius, under the walls of Rome, and drove it into the Tiber. He then entered the city in triumph, set at liberty all whom Maxentius had unjustly imprisoned, and pardoned all who had taken up arms against him. He was declared by the senate, chief, Augustus, and *pontifex maximus*. In the year 313, together with Licinius, he published the memorable edict of toleration in favor of the Christians. By this every one was allowed to embrace the religion most agreeable to his own mode of thinking, and all the property was restored to the Christians that had been taken from them during the persecutions. They were also made eligible to public offices. This edict marks the period of the triumph of the cross and the downfall of paganism.

Constantine had married his daughter to Licinius; but the latter, jealous of his fame, conceived a mortal hatred against him, which he displayed by persecuting the Christians. Both emperors took up arms and met in Pannonia 314 A.D. Licinius was defeated, but the conqueror granted him peace. He, however, renewed hostilities, was vanquished again, taken prisoner, and put to death at Constantine's command. Thus the latter became, in 325, the sole head of the Eastern and Western empires. His first and chief cares were the establishment of peace and order, and the propagation of his religion. Many beneficial decrees were proclaimed by him. Among these were those which abolished all the establishments of debauchery, ordered the children of the poor to be supported at his expense, gave permission to complain of his officers, and promised that the emperor would not only hear complaints, but compensate the complainants for injuries received, when they were proved to exist. He diminished the land-taxes, and caused a new valuation of estates to be taken. The state treasury had always been enriched by the property of criminals; but Constantine spared the property of their wives, and ameliorated the condition of their children. Death in prison, he said, was a cruel punishment for the innocent, and an insufficient penalty for the guilty; he therefore ordered all trials of prisoners to take place at once. He forbade the use of unwholesome dungeons and oppressive chains. He gave leave to sick persons, widows, and orphans, to appeal from the local magistrates, and refused this privilege to their adversaries. It had been customary for the heirs of a person deceased to divide his slaves among them; Constantine forbade the separation in these cases of husbands from their wives, and of parents from their children. To the Christians he gave permission not only to erect churches, but to be remunerated for the cost of them from his domains. Amidst all the cares of government and the occupations of war he found leisure to assemble the Council of Arles, to put an end to the schism of the Donatists. The ecumenical council held at Nice, in Bithynia 325 A.D. was attended by him in person.

On 26 Nov. 329 he laid the foundations of a new capital of the empire, at Byzantium, upon the Bosporus, in Thrace. The city of Byzantium had been almost entirely destroyed by Severus; it was rebuilt by Constantine, enlarged and adorned with open squares, fountains, a circus, and palaces, and called by his own name. Constantine divided the empire into four parts, governed by four prætorian prefects. Toward the close of his life he favored the Arians, to which he was induced by Eusebius of Nicomedia; and he even banished many Roman Catholic bishops. In the year 337 he fell ill in the neighborhood of Nicomedia, was baptized, and died after a reign of 31 years.

Constantine committed a great political error in dividing his empire among his three sons, Constantine, Constantius, and Constans. His zeal for Christianity appears to have been excited not less by the knowledge that the religion which was embraced by a majority of the inhabitants of the Roman empire must prevail, and that, of course, the strength of the government must be increased by protecting it, than by a wish to apply its consoling powers to the relief of a heavy conscience. He has been accused of inordinate ambition, excessive liberality, and an Oriental fondness for parade. But he was brave at the head of his army, mild and indulgent in his intercourse with his subjects, the favorite of his people, the terror of his foes. He was fond of the sciences as well as of arms, and gave them his protection. He read much, and wrote nearly all his own letters. In Eusebius we find many proofs of his theological learning. Some of the martyrologists have counted him among the saints, and fix 20 May as his festival. The Greeks and Russians observe it upon the 21st of the same month. Among all the writers who have attempted to describe the character, influence, and policy of Constantine, Gibbon, from the extent of his researches and the profoundness of his views, appears to deserve the first place, though his impartiality is more than doubtful. See Eusebius, 'Vita Constantini'; Gibbon, 'Decline and Fall of the Roman Empire'; Fletcher, 'Life of Constantine the Great' (1852).

Constantine II., Flavius Claudius Constantinus, Roman emperor: b. Arles, Gaul, 7 Aug. 312; d. near Aquilea, Italy, 340. He was the eldest son of Constantine I., and received as his share of the empire on the death of his father, Gaul, Spain, and Britain. Being desirous, however, of possessing himself of the territory of his brother Constans, he invaded the latter's dominions, but was defeated and killed.

Constantine IV., Flavius Constantinus, Emperor of the East; surnamed POGONATUS, or the BEARDED; d. 685. He was son of Constans II., whom he succeeded in 668. His two brothers, Tiberius and Heraclius, shared the title of Augustus, but had little or no share in the government, and toward the close of his reign, Constantine IV., under the influence of suspicion, had them mutilated and put to death. Constantinople was unsuccessfully attacked by the Mussulmen in 672 and the six following years; and it was during these wars that the famous "Greek fire" was invented. Constantine con-

voked and took part in the sixth general council held at Constantinople, at which the doctrine of the Monothelites was condemned.

Constantine V., emperor of the East: b. Constantinople 719; d. near Selymbria, Thrace, 14 Sept. 775. He was surnamed Copronymus and succeeded his father, Leo the Isaurian, in 743. He sided with the Iconoclasts, who hurled down the images of the saints, and persecuted the followers of the Roman Catholic Church. He died in an expedition against the Bulgarians.

Constantine VI., Flavius Constantinus, Emperor of the East: b. 771; d. Constantinople about 797. He was son of Leo IV., whom he succeeded in 780. Being only 10 years old when his father died, his mother Irene was his guardian and regent of the empire. On arriving at a mature age he wished to assume the government himself; but Irene, made cruel by ambition, had him imprisoned. He escaped in 790, exiled his mother, recalled her, and finally, ruined by his licentious living, and despised by his subjects, a conspiracy was formed against him, Irene taking the lead in it; and being imprisoned, his eyes were put out by her order.

Constantine VIII., emperor of the East: b. 905; d. 15 Nov. 959. He was surnamed Porphyrogenitus, and succeeded Leo the Wise in 905. He was destitute of energy, and devoted himself chiefly to study. He admitted colleagues to the throne so that at least five emperors were reigning together. Constantine VIII. left a treatise on state affairs, a geography of the empire, and the 'Life of the Emperor Basilius, the Macedonian.'

Constantine X., emperor of the East: d. 1028. He was the son of Romanus II., succeeded John Zemisces, and was proclaimed emperor of the East, with his brother, Basil II., who held the principal authority till 1025, when he died. Constantine X. was, after that, sole emperor.

Constantine XIII., Palæologus, emperor of the East: b. 1394; d. 29 May 1453. He was the last of the Greek emperors, and succeeded to the throne in 1448. He was killed in bravely defending Constantinople against Mahomet II., who in 1453 besieged the city with 300,000 men. The heroic valor displayed by Constantine XIII. in this unequal contest demands our admiration; but valor was of no avail, the city was taken by storm, and thus ended the Greek empire.

Constantine, Paulovitch, Russian grand duke: b. St. Petersburg 8 May 1779; d. Vitebsk 27 June 1831. He was the second son of the Emperor Paul of Russia. In the wars against France he distinguished himself by his personal bravery, though not by his capacity for command. He was the elder brother of the Emperor Nicholas, to whom he ceded the crown on the death of Emperor Alexander I., their brother. Constantine was afterward made viceroy of Poland, and ruled that unfortunate country with great severity.

Constantine, Nikolaevitch, Russian grand duke: b. St. Petersburg 21 Sept. 1827; d. there 24 Jan. 1892. He was the second son of the Emperor Nicholas of Russia, and brother of the Emperor Alexander II., grand duke and great admiral of Russia. In the war of 1854–6 he had the defenses of the Baltic intrusted to his care, in conjunction with Admiral Lütke; but the policy of the emperor hardly allowed the prince any display of courage or ability. He was made viceroy of Poland in 1862, but resigned the next year. He was president of the council of state 1865–81, but being suspected of sympathizing with the revolutionary party was dismissed from office.

Constantine, Flavius Julius, Roman soldier. He was raised by the army in Great Britain to the imperial dignity in 407, on which he crossed over to Gaul and conquered that country and Spain. He fixed his court at Arles, where he was besieged by Constantius, the general of the Emperor Honorius, to whom he surrendered on the promise that his life should be spared; but it was basely violated, and both Constantine and his son were put to death, 411 A.D.

Constantine, kŏn-stăn-tēn', Africa, a town in the French territory of Algeria, capital of the province of Constantine, on a rocky peninsula, 1,968 feet above the sea, and accessible only on one side. It is surrounded by walls, built by the Arabs chiefly with stones which the Romans had hewn and carved, and is entered by four handsome gates. The streets, though well paved, are narrow and dirty, and the houses are very indifferent. The only edifice deserving of particular notice is the palace of the bey, now the residence of the French governor. It is more remarkable for its internal decorations than for its external structure. Both within the town and in the vicinity Roman remains abound. It is the Episcopal see of a Catholic bishop. The French have here a college and the Mohammedans, a seminary. The manufactures consist chiefly of woolen and linen goods and various articles in leather; the trade is in corn, linen, and wax. It is connected by railroad with Philippville, its port of entry, 47 miles distant, and with the largest towns in the territory. Constantine was built by the emperor whose name it bears, on the site of Cirta, the capital of the Numidian kings, which had fallen into decay. In 1837, after a long siege, the French took it by assault. Pop. (1902) 50,000.

Constantine, Arch of, one of the noted triumphal arches of the world, erected by order of the Roman senate to commemorate the victory gained by Constantine over Maxentius. It is situated between the Cælian and Palatine Hills, and was built in 315. This monument of victory is well preserved, but while it tells of the power of the Emperor Constantine, it also bears witness to the incompetency of the Roman sculptors of the period in which it was built. The whole design was copied from the Arch of Trajan, even the reliefs were removed to the Arch of Constantine, and they illustrate the battles and victories of Trajan and not of Constantine. The parts copied or taken from Trajan are of superior design and workmanship, but the sculpture of the artists of the day, representing the deeds and victories of Constantine are inferior in design and crude in workmanship. Four stately columns are on each face, one high and two lower entrances. The inscriptions proclaim the great deeds of the emperor.

Constantine Tolmen, a great oblong stone, 33 feet long, 18 wide, and 14 thick, poised on the points of two upright rocks in Cornwall,

England. This mass weighs 750 tons. It is one of the natural curiosities of Cornwall.

Constantino'ple, called by the Turks *Stamboul,* by the Greeks, *Istampoli* (both derived from the Greek *eis tōn polin,* into the city), Turkey in Europe, capital of the Turkish empire, lat. 41° 0′ 18″ N.; lon. 28° 59′ 15″ E., with the Sea of Marmora and the Bosporus on the south and east, and the Golden Horn, an inlet of the latter of about six miles in length, on the north. It is surrounded by water on all sides excepting the west, and has a sea front altogether of about eight miles in extent. The city is triangular in shape, its apex projecting into the Bosporus, and its base, a lofty double wall of four miles in length, stretching across the promontory, from the Sea of Marmora to the Golden Horn. Each of the sides may be about three and three fourths miles in length, and within these limits the whole of the city proper is included. On the opposite side of the Golden Horn, and also occupying the extremity of a promontory, sometimes called the Peninsula of Pera, are situated the extensive suburbs, Galata, Pera, and Tophana. Constantinople was formerly walled on all sides; but the walls along the Golden Horn and Sea of Marmora, the north and south sides of the city respectively, are in a ruinous state, and in many places have altogether disappeared. The inland or west wall, a magnificent specimen of mural architecture, containing six gates, though also dilapidated in parts, could be easily restored. The streets are extremely narrow, dark, dirty, and ill-paved, and so crooked that hardly any two of them run for any length parallel to each other. The houses are generally low and ill-built. The windows are strictly closed with lattice-work of cane, in the centre of which the wife of the Turk, excluded from public view, endeavors to see what is passing in the street. The city is supplied with water by public fountains, which are very numerous, and some of them extremely beautiful, having pure white marble façades, elaborate arabesque ornaments, and Chinese roofs; they generally stand in the centre of an open square. On the extreme northeastern point of the promontory on which the city stands, called Point Serai, is situated the Seraglio or palace of the sultan, having the Bosporus in front and the Golden Horn on the left, and commanding a magnificent view of the opposite shore, including the beautiful town of Scutari, and its cypress-covered hills. The Seraglio, with its gardens and groves, includes a large space, and is washed by the sea for two thirds of its extent. Having been enlarged and altered at various periods, according to the taste or caprice of the princes and sultanas, it now consists of a conglomeration of buildings, clustering together without order or design. Its apartments, however, are spacious and richly furnished. At the principal entrance is a large and lofty gate, called Babi Humayon, "the high door" or "sublime porte," from which has been derived the well-known diplomatic phrase, all political business being transacted, as supposed, under this portal. Within the precincts of the palace is the celebrated divan and the harem, with the "Garden of Delight," in which are numerous gorgeous parterres and pavilions. The Adrianople and Constantinople railway here runs along the coast and has a terminus.

There are a great number of mosques in Constantinople, all of them more or less distinguished by grandeur and beauty; but the most remarkable are the royal mosques, of which there are about 15, among the finest in the world. Of these the largest and most splendid is that of Suleimania, situated on the northeast side of the city, and standing in the midst of a large square, surrounded inside by an arcade upon pillars of granite and marble. Next to it in extent, but of much older date, is the famous mosque of St. Sophia, near the east extremity of the city, the pattern of almost every mosque in the land; its walls and domes, of which last it has 20 of equal dimensions, springing from the same level, and sustained by 12 huge columns, are encrusted with mosaics, forming various figures and devices. The court or open square in which it stands is paved with marble, and shaded by fine plane-trees. This is the most ancient existing Christian church, having been only converted into a mosque in 1453. It has latterly been thoroughly restored by an English architect, by order of the sultan, and the layer of plaster removed by which the superb mosaics and frescoes that decorate its walls were covered. The mosque of Yeni Djami, known also as that of the Sultana Valide, was built by the mother of Mohammed IV., and is esteemed one of the most magnificent in the capital. It stands almost on the edge of the port, and this point, being the ferry between Galata and Stamboul, is constantly thronged with boats. Here almost every Frank first lands in the "City of the Faithful." The mosque is constructed of white marble, and has two peculiarly elegant minarets, encircled by no less than three galleries of richly perforated workmanship. The principal dome rests upon four lesser ones, which appear to lift it to the clouds. Another celebrated mosque is that of Sultan Ahmed, a little southeast from the former. From the elevated position this building occupies it is the most conspicuous object in the city when viewed from the Sea of Marmora. The minarets are of great beauty, and ascend to an immense height. All the other mosques are much less in size than those described, but very much resemble them in plan and other features. All of them are enriched by splendid columns of marble, Egyptian granite, or serpentine, and have massive and highly ornamented gateways and porches, and handsome courts and cisterns for ablution.

The bazaars of Constantinople are numerous but in no way very remarkable. Some of them are covered, others open. The covered bazaars have a somewhat mean appearance, resembling a row of booths at a fair, but the arrangement and manner of exposing the gay and glittering wares is sufficiently attractive. The principal or Great Bazaar consists of long avenues covered over with lofty arches of brick, lighted by apertures in the roof, and branching off in different directions. The ceilings of the vaults, and various parts of the walls, are ornamented with painted flowers and devices. On each side of the passage are counters and stalls, with a wide passage between them, and on each counter sits the merchant, generally smoking his pipe or chibouk, with his crossed legs drawn under him. The bazaars, both the open and covered, are severally allotted to particular trades and merchandise; they are generally so crowded,

chiefly by ladies, that it is difficult to pass through them. Constantinople has but one remarkable square, called the At-Meidan. It occupies the site of the ancient Hippodrome, "horse-course," a place at one time of great splendor, having been ornamented with marble colonnades, and surrounded by seats like an amphitheatre. The present area is an irregular quadrangle about 200 yards long by 150 wide, containing some obelisks which belonged to the ancient structure, one of which, of granite, is composed of a single piece 50 feet high. The numerous public baths in the city are mostly of marble, of plain exterior, but handsome and commodious within, with every accommodation and appliance requisite. They are divided into a number of circular rooms, lighted from above, and sufficiently spacious to admit a number of bathers at the same time. There are a vast number of coffee-houses and lodging-houses, called khans, dispersed throughout the city. The latter resemble immense stone barracks or closed squares. They are intended for the use of strangers during their temporary sojourn in the city, who may have an apartment here, with command of the key. The cemeteries of Constantinople, outside the western wall, are among its greatest ornaments. From their antiquity, and the trees planted in them, they have become vast forests, extending for miles round the city and its suburbs. Jews, Armenians, and Greeks have their own quarters in the city.

The few manufactures of Constantinople are chiefly confined to articles in morocco leather, saddlery, tobacco-pipes, fez caps, arms, perfumes, gold and silver embroideries, etc.; but its foreign commerce is considerable. The harbor, or Golden Horn, which more resembles a large river than a harbor, is deep, commodious, well sheltered, and capable of containing 1,200 large ships, which may load and unload alongside the quays. It is about six miles long, and a little more than half a mile broad at the widest part; its general breadth, however, does not much exceed a quarter of a mile. The Golden Horn is usually crowded with vessels and light boats, and presents a lively bustling scene. Among the imports are corn, iron, timber, tallow, and furs from the Black Sea and Russia; cotton stuffs and yarn, woolens, silks, watches, furniture, jewelry, coffee, sugar, pepper and spices, spirits, etc. The exports consist of silks, carpets, hides, wool, goats' hair, madder, valonia, etc. In 1897, 14,753 vessels, with a tonnage of 11,456,178, entered and cleared; 4,567 of which, with a tonnage of 6,505,925, were British.

Of the suburbs of Constantinople the largest is Galata, still the principal seat of commerce, though the city is partly displacing it. It has many very dirty streets, but much improvement has been effected in recent years. It is here that the merchants of all nations have their stores and counting-houses. Here, too, are situated the government docks, ware-houses, rope-walks, workshops, and custom-house for European goods. Pera occupies the more elevated portion of the promontory, of which Galata forms the maritime part. It is the aristocratic and finest portion of the city, and contains the ambassadorial mansions, the sultan's palaces and gardens, several fine hotels, the English Memorial Church, the artillery barracks, a public garden, the Protestant, Catholic, and Armenian cemeteries, etc. Tophana is situated a little farther up the Bosporus than Galata, of which it forms a continuation. Here is a government foundry and arsenal for cannon, artillery barracks, a fine fountain, and a spacious quay. Kassim Pasha, to the west of Galata and Pera, contains the admiralty offices, dry docks, barracks, saw-mills, machine-shops, arsenal, etc.

Constantinople occupies the site of the ancient Byzantium, and was named after Constantine the Great, who rebuilt it in 328 A.D. No city in the world has been subjected to such numerous and celebrated sieges, and no other has undergone so many vicissitudes of fortune. Yet it has only been taken twice, namely, in 1204 by the Crusaders, who retained it till 1261; and by the Turks under Mohammed II., 29 May 1453—an event which completed the extinction of the Roman empire in the East. The inhabitants are Turks, Arabians, Greeks, Armenians, Jews, Circassians, Bulgarians, and various other nationalities. Pop. 1,125,000. Consult: Gautier; Grosvenor; Van Milligen, 'Byzantine Constantinople'; Pears, 'Fall of Constantinople'; Clement, 'City of the Sultans.' See BYZANTINE EMPIRE; BYZANTIUM.

Constantinople, General Councils of, are in number four; the First, attended by 150 eastern bishops, and held in 381 is reckoned as the second ecumenical council of the Church, the first being that of Nicæa in Bithynia, 325. Its president was at first Miletius, patriarch of Antioch, and after him Gregory of Nazianzen, then archbishop of Constantinople: the council, comprising only eastern bishops was not reputed ecumenical till after the western Church had approved its decrees by express or tacit consent. The council defined the creed of the Church as opposed to the heresy of Arius and kindred heresies growing out of it, among them the heresy of Macedonius who denied the godhead of the Holy Spirit; hence to the creed called of Nicæa this council added the clause, "and in the Holy Spirit, the Lord and life-giver who proceedeth from the Father, who with the Father and the Son is together worshipped and glorified, who spake by the prophets." Not till a later date was added "and the Son" (in Latin filioque) to declare the procession of the Spirit from the Son also. The Second Council of Constantinople—the 5th ecumenical—was held in 553, with 165 bishops, all eastern. The heresies it condemned had relation to the heresy of Nestorius, who held that there were in Christ two persons, a human and a divine. This council, at first regarded as Oriental, was later accepted as ecumenical. The Third General Council of Constantinople, held in 680, was presided over by legates of the bishop of Rome, Pope Agatho. The errors it condemned were those of the Monothelites (q.v.); it was the Sixth ecumenical council. The Fourth General Council of Constantinople (the eighth ecumenical), held in 860, was convoked for the purpose of ending the schism then separating the eastern from the western Church. This council decreed the deposition of Photius, the usurping patriarch of Constantinople, and the restoration of Ignatius the rightful patriarch; but both this decree and the measures proposed by the council for reconciling the eastern with the western churches were repudiated by the Greek Church; and the schism grew wider and has continued, with an interval of communion now and again, till the present time.



BIRDS-EYE VIEW OF CONSTANTINOPLE.

Constantinople, Strait of. See Bosporus.

Constantius I., Flavius Valerius, Roman emperor, surnamed Chlorus: b. about 250; d. York, Eng., 25 July 306. He was nephew of the Emperor Claudius II., became Cæsar in 292, received Britain, Gaul, and Spain as his government, and after re-establishing Roman power in Britain and defeating the Alemanni, became one of the two Augustuses in 305. Constantine the Great, his son, was his successor.

Constantius II., Flavius Julius: b. Illyricum 317; d. 361. He was son of Constantine the Great and Fausta, was emperor of Rome from 337 to 361, reigned first in the East, and waged a protracted war against the Persians, which prevented him from participating in the struggles of his brothers Constantine II. and Constans in the West. After the fall of both he marched in 350 against Magnentius and Vetranio, who had usurped the purple. Vetranio submitted; Magnentius was finally crushed and committed suicide. Constantius now reigned over the whole empire. In 354, having returned to the East, he put to death his cousin Gallus, whom he had left there at the head of the army. He chose his brother Julian as Cæsar, and sent him to Gaul, where he successfully fought against the Alemanni and Franks. In 360 Julian was proclaimed emperor by the army at Paris. Constantius marched against him, but died on the way in Cilicia. Julian was his successor.

Constellation, The, a famous vessel which won brilliant victories in the West Indies under Commodore Truxton (q.v.). It was built at Baltimore by David Stodert, and launched 7 Sept. 1797, as one of six frigates ordered by the national government for service against the Barbary pirates; was of 1,265 tons, and cost $314,212. The outrages of the French on our West Indian commerce having brought on war in 1798, the Constellation was sent under Truxtun to cruise off Porto Rico; and on 9 Feb. 1799 he overhauled a French warship, L'Insurgente, with which, at 3.15 P.M., he joined battle at pistol-shot. The Constellation, nominally of 36 guns, had an armament of 48; the Insurgente, of the same size, had 40, but of heavier calibre, firing 792 pounds of metal to the American's 848. The American had 309 men, the Frenchman 409. Truxtun was the better sailor, and his guns were far better served; he managed to pass back and forth repeatedly athwart the other, and rake her from end to end, cutting her maintopmast near the outset and largely disabling her movements; and when the Insurgente struck after an hour and 14 minutes, she had lost 29 killed, 22 badly and 19 slightly wounded, while the American loss was two killed and three wounded. The London merchants presented Truxtun with a handsome piece of plate for this service. On 1 Feb. 1800 he sighted another, the Vengeance, of 52 guns and 330 men, against his now 50 guns and 310 men, about 15 miles west of Basse Terre; she endeavored to escape, and it was not till 8 P.M. of Sunday, the 2d, that he came within range, when the Vengeance opened fire. Truxtun wished to close, and forbade his men to fire till they were within pistol-shot, though the French broadsides were deadly; but the Vengeance sheered off and fired almost entirely at the rigging, cutting the shrouds, stays, and spars into shreds, and at last leaving the mainmast so unsupported that it came down with the topmen and a midshipman. Meantime Truxton had fired his broadsides with fearful slaughter; and by midnight entirely silenced the French guns; but the above mishap about this time forced him to spend an hour in repairs, and the French vessel escaped. The American loss was 14 killed and 11 mortally wounded, and 14 others wounded; the French, 50 killed and 110 wounded, the Frenchman's hull being struck with 186 round shot. Congress presented Truxtun with a gold medal for this action. During the entire War of 1812 the Constellation was blockaded at Norfolk. In 1815 she was part of Decatur's fleet in the Mediterranean, and was one of the squadron which captured the Moroccan vessel Mashouda after a savage conflict on 26 August. Consult: Maclay, 'History of the American Navy,' Vol I. (1900).

Constella'tions (Lat. *con*, "together," + *stella*, "star"). From the earliest times men have formed certain groups of bright stars into constellations. Thus the names of the 12 zodiacal constellations are prehistoric. The same is true of many of those clustering about the north pole of the heavens. Quite a number bear the names of members of the Argonautic expedition, or of persons who were in some way connected with it, which determines the age of their formation approximately. The earliest description of the constellations of which we have any record is by Eudoxus, who lived about 360 B.C. This work is lost, but a poetic paraphrase of it by Aratus, who lived about 100 years later, is still extant. This work mentions 45 constellations. The earliest star catalogue which has survived to modern times is the 'Syntaxis'; that is, 'Compendium.' This is usually known as the 'Almagest,' which means "The Greatest," of Ptolemy. His observations were made between 121 and 151 A.D. The catalogue contains 1,028 stars divided among 48 constellations. This completes the ancient classification, and no permanent additions were made to it until 1602, when one constellation was added by Tycho Brahe. The next year appeared Bayer's 'Uranometria,' a series of star-maps containing 1,709 stars and 12 new southern constellations. These maps were decorated by a series of drawings made by Dürer, whose outlines have until recently served to ornament the constellations as represented on certain maps and stellar globes. These were the first star-maps published, although stellar globes were introduced in the middle of the previous century by Mercator.

Before Bayer's time it was customary to describe the position of a star by its location in the animal or figure represented by the constellation. Thus Aldebaran was the bright star in the eye of the bull. From this it would appear that the ancients had manuscript maps with figures drawn upon them, but none of these maps have come down to our time. Bayer introduced the important innovation of lettering the various stars with the letters of the Greek and Roman alphabets, a separate set of letters being used for each constellation, thereby greatly simplifying the designation of any particular star. Strangely enough he did not letter his 12 new southern constellations, so that these stars still had to be designated by the

cumbrous methods of the ancients. In Flamsteed's catalogue, issued early in the 18th century, the stars are numbered in the order of their right ascension, and both letters and numbers are still in general use. From the earliest times some of the brightest stars have received special names, such as Sirius, Arcturus, etc. Although these are still in common use, there is a tendency among astronomers to substitute Bayer's nomenclature in their place.

Following Bayer a number of new constellations were introduced by various astronomers, notably Hevelius, Lacaille, and Royer. Many constellations were proposed which have failed to meet with universal acceptance, and the number which is now generally adopted by astronomers is 67. There is no definite agreement as to their exact outlines. Indeed, such an agreement would be impossible unless the boundaries followed definite circles of the celestial sphere. All stars brighter than the 9.5 magnitude are now designated by their numbers in certain large modern catalogues. Fainter stars are located by their right ascension and declination at certain dates. These quantities correspond to terrestrial longitude and latitude.

The shapes of the constellations are entirely matters of accident, and in only a few instances are the brighter stars contained in them arranged in such a manner as to bear any resemblance to the object for which the constellation is named. The exceptions to this rule are the Scorpion, the Southern Cross, the Northern and Southern Crowns, and the Southern Triangle. On the other hand, certain characteristic forms are obvious in the heavens which bear no relation to the name of the constellation in which they occur. The Great Dipper in Ursa Major, known in England as Charles' Wain (or Wagon), the Y in Bootes, the Sickle in Leo, and the cross in Cygnus, are well-known examples. Good modern star-atlases have been published by Schurig and by Upton.

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Constipa'tion, a condition in which the normal number of evacuations from the intestinal canal does not take place, or one in which the fæces are extremely hard and painful in passing. Constipation affects all ages, being prevalent in childhood, youth, adult life, and old age. It can for the most part be regulated by proper hygienic living, but by reason of extreme carelessness in this regard is frightfully prevalent.

The symptoms of constipation vary considerably. In infants there is always pain; the child cries, especially on attempts to defecate; there is usually much colic; there may be fever. In adult life the symptoms are fairly well marked. There is the time element, which is known; there is pain on passage, due to hardness of the fæces; and there may be feelings of bloating, coated tongue, headache, or backache, all of which are characteristic of this condition. In fact the symptoms which are described very widely in patent-medicine circulars as due to disease of the kidney, brain, lost manhood, and vague menstrual irregularities are nothing more or less than symptoms of ordinary constipation, and the patent-medicine business succeeds largely because it ascribes to this extremely common malady names of very much more dangerous illnesses. Practically most patent medicines are hardly more than cathartics.

The causes of constipation are in the main two,—lack of water in the intestines, and lack of muscular power of the unstriped muscle of the intestinal walls. Lack of water may result from insufficient drinking of water. It may also result from increased elimination of water, as in excessive sweating. It may also be the result of diminished secretions of the normal juices of the intestines,—the gastric juice, the bile from the liver, and the pancreatic and intestinal juices.

These are all essential in adding fluid to the intestinal canal. Insufficient muscular power in the intestines may be due to a number of causes. Lack of tone of the body in general, resulting from insufficient exercise and insufficient food, is one of the most important. Bad dressing is a second cause for this loss of muscular tone. It may be a symptom of a nervous disorder such as is very frequently found in paraplegia (q.v.), in locomotor ataxia and other grave spinal disorders, in which case the motor paralysis is more or less permanent. Lack of muscular power may also be the result of taking fluid diet; thus the intestine has no irritants and the muscular power is not invoked. A frequent cause of constipation is tea-drinking.

The treatment of constipation is self-evident if one takes into consideration the two underlying causes and remedies them. The drinking of water, out-door exercise, sunlight, the eating of food that has plenty of residue, such as bread, spinach, lettuce, cabbage, celery, etc. These are very helpful. The first absolute necessity, however, in the treatment of constipation, is to establish a habit of regular daily movement. In order to do this it is essential that a time should be taken which is ordinarily not interfered with, and the individual should consider a certain 15 minutes of the day to be sacredly devoted to this duty. So far as drugs are concerned in the treatment of constipation, they are best left alone; but if it becomes absolutely necessary that a drug should be used, it is a cardinal principle to remember that alternation of drugs is advisable. The same drug used day in, day out, and week after week, tends to diminish the power of the intestine and habituate it to a given drug. This results in some frightful cases of constipation. In a few cases of constipation in which the cause is due to some obstruction, as some solid body situated near the intestinal canal and pressing upon it, surgical treatment is imperative. See Cathartic.

Constit'uent Assembly, a name given to the first convention of the delegates of the French nation (1787–91) to distinguish it from the legislative assembly of 1791. It drew up and obtained the acceptance of the first of the famous revolutionary constitutions. The Constituent Assembly of 1848 had a similar aim.

The opening of the States-General of 1789 was set for 4 May, the deputies being presented to the king on that day, and religious services held. On 5 May the formal opening took place in a magnificent hall; the king and royal family being present. According to the decision of the king's council the claim of the Third Estate to be equal in numbers to the two others was granted, and from the first these representatives of the people took a threatening attitude. The

representatives from the rural districts and small towns constituted the Third Estate; they were more in number than the other members of the assembly. (See FRANCE.) On 17 June, on a motion of the Abbè Sièyes, the majority voted in favor of constituting the body a "National Assembly."

Three days later, 20 June 1789, the deputies under the lead of Bailly gathered on a tennis ground near their usual place of meeting and took an oath not to permit the dissolution of the assembly until a new constitution had been given to France. On 11 July, Lafayette presented the celebrated Declaration of Rights, which after discussion was ordered placed at the head of the constitutional code.

From time to time the assembly voted addresses to the king and Louis had several times appeared before them and expressed his views. Early in October he signed the Declaration and the Constitution.

Constitution, the fundamental law of a state, whether it be a written instrument of a certain date, as that of the United States of America, or an aggregate of laws and usages which have been formed in the course of ages, like the English Constitution.

I. Constitutions, according to their origin or their fundamental principle, may be divided into three classes: (1) Those established by the sovereign power; (2) those formed by contracts between nations and certain individuals whom they accept as sovereigns on condition of their complying with the terms of the contract; (3) those formed by a compact between different sovereign powers.

1. The first class may be again divided into: (*a*) constitutions established by a free sovereign people for their own regulation, of which sort is the Constitution of the United States; and (*b*) such as have been, in some instances, granted by the plenary power of absolute monarchs to their subjects, and which in theory are the voluntary gift of the beneficence of the ruler. These are called by the French *constitutions octroyées,* from *octroyer,* to grant.

2. The second great class of constitutions mentioned above includes such as have been formed by a contract between the future ruler and the people. These are mutually binding on each party as long as the other fulfils his duty. Such, in a great degree, is the British Constitution.

3. Some constitutions are compacts between several sovereign powers. Such was the constitution of the German empire and that of the United Provinces of Holland, and such is also the Swiss Confederation. The Constitution of the United States, though the different States call themselves sovereign, proceeded, in point of fact, from the people of the United States collectively, as is apparent from the very beginning of the instrument: "We, the people of the United States," and not "We, the States." Moreover, the Congress, established by this Constitution, has rights and powers far exceeding those which other confederate but entirely distinct governments are wont to allow each other. The Constitution, in short, unites all the States into one nation, the government being called by all parties the national government. Governments entirely and virtually distinct from each other never would, however closely confederated, allow a government, particularly a national government, to be established over themselves. The Constitution of the United States is more than a mere compact between independent powers, yet less than the simple constitution of an undivided nation: it ought rather to be considered as forming one whole with the different Constitutions of the States which have given up to the general government most of the rights of sovereignty, as that of making war and peace, coining, etc.

II. In regard to political principles, constitutions are: (1) Democratic, when the fundamental law guarantees to every citizen equal rights, protection, and participation, direct or indirect, in the government, such as the Constitution of the United States and those of some cantons of Switzerland; (2) aristocratic, when the constitution establishes privileged classes, as the nobility and clergy, and intrusts the government entirely to them, or allows them a very disproportionate share in it; such a constitution as that of Venice, and such as, at one time, those of some Swiss cantons, for instance, Bern; (3) of a mixed character, to this latter division belonging some monarchical constitutions, which recognize the existence of a king whose power is modified by other branches of government of a more or less popular cast. The British Constitution belongs to this last division.

III. The forms of government, established by the various constitutions, afford a ground of division important in some respects; and, lastly,

IV. The principle on which a constitution establishes the representation, or the way in which the people participate in the government, furnishes an important means of classification: (1) Some allow the people to partake in the government without representation, as was the case in many of the small states of ancient Greece, and also in the ancient Roman republic, and is still the case in several of the small Swiss cantons, in which the whole people assemble and legislate; it being obvious that such a constitution can operate only where the number of citizens is very small, and even then will be almost always objectionable; (2) some are of a representative character; that is, all the citizens do not take an immediate part in the government, but act by their representatives; constitutions of this sort, either establishing a general and equal representation, as those of the United States; or connecting the right of representation with particular estates and corporations. The term representative constitution is frequently applied exclusively to the former by way of eminence.

V. Representative constitutions may be divided into: (1) Such as are founded on the union of the feudal estates, the clergy, nobility, citizens, and peasantry; the two latter of which derive their right of representation from the charters of the ancient corporations; (2) such as establish the right of a general representation, like the American Constitution, and such as partake of both characters, like the British Constitution. Those of the first class either originated in the feudal times, or have been since copied from such as did. The feudal states were conglomerates of many heterogeneous bodies; and it was reserved for later ages to unfold the true principles of government — to separate the essential from the unessential and injurious — to give stability, distinctness, and extent to

principles before unsettled, indefinite, and limited in their operation. See articles on the different countries of the world for information respecting their various constitutions.

Constitution, Framing of the. The Articles of Confederation (see CONFEDERATION, ARTICLES OF) were an organized national suicide, carefully barricaded against help. The scheme was unworkable except by general, constant, and hearty unanimity; yet it was made unchangeable except by unanimous consent. The impotence of the scheme had been foreseen before it went into operation at all. Hamilton in 1780, while Maryland was still blocking its adoption, had privately analyzed its evils and suggested a convention of the States to frame a better one. This plan was publicly put forth in a very influential pamphlet of Pelatiah Webster in 1781; and recommended in a resolution of the New York legislature in 1782, seconded by that of Massachusetts in 1785. But the change finally had to be accomplished under a sort of false pretense, justified by the right of the nation to live and of the people to consent. The last straw had been the failure of the Confederate Congress in obtaining permission to lay duties for 25 years, to produce a revenue independent of futile appeals to the States; all consented, but New York did so only on condition of herself levying and collecting the duties, and appointing and dismissing the officers. As this left the funds in her hands as before, it killed the whole intent of the plan; and showed anew that one large State could paralyze national action. The friends of efficient government then made use of a convention already called, the Annapolis Convention (q.v.), which they dominated; it had no authority but to regulate trade, but reported that nothing could be done under such a government, and recommended calling a fresh convention to amend it — the changes of course to be consented to by all the States. Congress issued the call for 14 May at Philadelphia; but a quorum (seven States, a majority) was not secured until the 25th. George Washington was appointed president; by 2 June four more States had come in, and on 23 July the New Hampshire delegation arrived. All were thus finally represented but Rhode Island, which was unalterably opposed to the scheme, and was the last to ratify the Constitution.

Three prime obstacles lay in the path of the convention: the small States' fear of the large, the one-crop States' fear of the national taxing power (and general tenacity of hold on the port dues by those which had ports), and the slave-trading States' determination not to have the business summarily stopped. The first, if not compromised, would have prevented any union at all, as the three "large States," Massachusetts, Pennsylvania, and Virginia — New York then counting as a "small State" — were scattered through the line; commercial interests quite possibly might have created three confederacies, the New England, Middle, and Southern; the slavery question would have created two, from New York to Delaware and from Maryland south. The first was assuaged by equal representation in the Senate; the second by the prohibition of taxing exports, with some other safeguards; the third by permitting the slave-trade for 20 years. These were three primary concessions which secured the votes of enough States to overlook the irregularity of the convention's title to create a new government, and join the Union under it; and without them there would have been no Union then, and most probably none now.

The first was by far the most difficult of all. The second and third could be and were cured by one or two single provisions, not difficult to draft nor very difficult to agree on; the first involved the very basic structure of the government, and cost a long struggle, great ingenuity, and much doubt about ratification. The situation was this: The convention assumed as a basis of debate that the 11 States represented had the following populations: Virginia, 420,000 (including three fifths of the slaves, as with all the five Southern States); Massachusetts, 360,000; Pennsylvania, 360,000; New York, 238,000; Maryland, 218,000; Connecticut, 202,000; North Carolina, 200,000; South Carolina, 150,000; New Jersey, 138,000; Georgia, 90,000; Delaware, 37,000. New Hampshire with 102,000 came late, and Rhode Island with 58,000 held aloof altogether. The three largest States were regularly reinforced by the three southernmost, who were next to or mixed with huge and powerful Indian confederacies against which they would like to turn the entire national force, and therefore favored a strong government; this gave a pretty constant large State vote of six for a "national" system, where the weight should be in proportion to size, and a small State vote of five for a federative one, like the Confederation, where each State had one vote. This further involved that the latter should be a one-chamber system, since two houses each representing sovereign States equally would be an absurd duplication. These two irreconcilable propositions were embodied in what were called the "Virginia" and the "Jersey" plans.

The former, presented by Edmund Randolph 29 May, was intended to obliterate the States as bodies from the government almost entirely. It was in substance, that the Congress should have two branches, membership in both proportioned to population, but the lower ones chosen directly by the people, the upper by the lower out of nominations by the State legislatures, the executive by both houses jointly; that Congress should have a veto on the State laws, and the President with part of the judiciary a veto on those of Congress; that Congress might coerce delinquent States, and should legislate on all matters where State action would cause discord in the Union (that is, commerce and taxation); that new States might be admitted; that all the obligations of the Confederation should be assumed, that members of State governments should take oath to support the national government, and that the new Constitution should be ratified by popular conventions instead of the State legislatures. A plan of Pinckney of South Carolina was in the same line. The committee of the whole, after debate and amendment, reported the amended bill favorably 13 June. The amendments had cut out the power of coercing the States, taken the veto from the judiciary and restricted it to the executive; made the executive's term seven years and not renewable, the senators' seven, and the representatives' three; had the State legislatures choose the senators; and styled the new system a "national" government. Two days later, William Paterson of New Jersey presented the "Jersey plan,"

whose distinctive differences were, that Congress should have but one chamber with each State voting equally, and should gain its revenue from requisitions as then, only having the power of coercing delinquent States. Coercion implied gaining a majority vote in an equal body to make war on one of the members, which would never have been granted. The other articles — that Congress should have the power of taxation and regulation of commerce, and of coercing refractory individuals as well as States, also of deciding disputes as to territory, etc. — were no stronger than the weakest link; Congress was given some powers extra to those of the Confederation, but was given no whit more power to enforce them. What the Confederation had lacked was not privileges, but force. Paterson's plan otherwise was much like Randolph's. The convention in committee of the whole adhered to the latter.

Hamilton attempted to forward a plan by which the Senate was to be chosen for life by electors chosen by popular vote, the executive for life by electors chosen by electors chosen by popular vote, and the State governors be appointed by the national government, with an absolute veto on the acts of the legislature. It found no supporters.

The first problem was to settle the basis of power between the States. Under Randolph's plan, the Senate would have had 28 members, of which the three "large States" would have had 13; and the House 65, of which they would have had 26 — two fifths of the latter and about half the former. Obviously they would be able, by a bargain with one or two of the smallest States, to choose the President and dictate the entire operations of the government. On the other hand, Paterson's plan was practically the Confederation plus more wind and paper decrees. The deadlock was absolute. John Dickinson of Philadelphia suggested consolidating the two plans, which was like consolidating a democracy and an autocracy. But on 21 June, William Samuel Johnson of Connecticut proposed the "Connecticut plan," the one finally adopted, making the States equal in the Senate and proportional in the House. His colleague, Ellsworth, supported him; but the vote on it showed a tie, five large to five small States, and Georgia's delegation divided. The question was referred to a committee of one from each State, which reported a compromise to win over the large States by restricting the power of originating money bills to the House, which they would control, and secure the slave States by counting in three fifths of the slaves as a basis of representation. With the addition of the power to the Senate to propose amendments to money bills, the compromise passed after a hot debate. The two New York delegates left the convention in wrath.

Another point which had to be compromised was the power of Congress over commerce. As matters stood, not only could each State lay any duties it pleased, so long as it did not violate treaties already made or take national property, and therefore fill the Union with prohibitive barriers, but a State like New York could ruin its neighbor, New Jersey, and deal a crushing blow at western Connecticut, whose port it was. Further, several States were not agriculturally diversified, but had one great crop — tobacco, or rice, or naval stores — a severe tax on which would bankrupt the entire State. The first of these difficulties was met at the outset by the conditional power given to Congress to regulate commerce between the States; the second was acknowledged by the insertion of the prohibition to tax exports, as said. A "committee of detail" reported a draft Constitution 6 August. It had 23 articles (finally boiled down to seven); the President was to have one term of seven years, and be chosen by Congress; there was no Vice-President, and the Senate chose a president for itself. This was debated till 12 September, and amended to its present form. The slave-trading States were given their solatium in the shape of permission to continue the trade for 20 years, and the entire slave group were placated by the fugitive-slave provision; the Vice-President and the electoral system was added, and a restriction of Congressional control of commerce to a two-thirds vote stricken out. On 12 September a committee of five was appointed to revise its form, and the actual work was mainly done by Gouverneur Morris (q.v.). The next day it was reported back, after a few changes — the chief requiring only a two-thirds instead of a three-fourths vote to pass a bill over a President's veto — and accepted. A new convention to consider amendments proposed by the States was voted down; they must take or leave it as it stood. Of the 55 delegates present, only 39 signed. On 17 September the convention adjourned. The Constitution and the resolutions of the convention were transmitted to Congress, which on 28 September ordered them sent to the State legislatures for action. (For the amendments, and the consequent difficulties about ratification, see CONSTITUTIONAL AMENDMENTS, HISTORY OF, below.) Only three States — New Jersey, Delaware, and Georgia — ratified it unanimously; Connecticut, Pennsylvania, Maryland, and South Carolina, by heavy majorities; Massachusetts, New Hampshire, New York (see FEDERALIST, THE), and Virginia by light ones, after a bitter and protracted struggle; North Carolina refused to ratify without many amendments and a bill of rights, and Rhode Island refused altogether till it was carried without her and she would have been shut out. There was great dissatisfaction, and only the commercial classes were heartily in its favor: John Adams said afterward that the Constitution was "extorted from the grinding necessity of a reluctant people."

Constitution, Immutability of The. The Constitution of the United States is the product of a few great minds assembled in a brief convention. A great statesman (Gladstone) has termed it "the most wonderful work ever struck off at a given time by the brain and purpose of man." This characterization has been accepted by all thinking men. There have been, indeed, cavils at some provisions, and speculative suggestions of alterations and improvements by individual minds; but the universal wonder is that the framers of the Constitution did so well; and that wonder was never so great as now at the close of a stormy century, littered with the wrecks of governments and nations and dynasties and constitutions.

The "given time"! The work was great, the difficulties many — most men then deemed them insuperable — and the work and its difficulties have had commentators and historians for

70 years or more; but will there be a single reader of this article who has noted how short a time it took to frame the Constitution? Has there been a single commentator or historian who has adequately shown how exceedingly brief the "given time" was? Less than a hundred working days measured it.

Moreover, the framers had had no means of previous personal communication by telegraph and almost none by mail; there were no stenographers or typewriters; there was, indeed, no clerical assistance; for the proceedings of the convention were secret and the clerical work was done by great men. When we see recent conventions with modern facilities for rapid work spending months in putting a few patches on existing State constitutions, we can best appreciate the ability of the men who in 85 working days forged the great compact of the people of the United States with themselves — a compact which has lasted more than a century substantially unchanged, which survived the storm of the greatest civil war of the modern world, which has expanded with an unforeseen and unprecedented expansion of inhabited territory from a narrow strip upon the Atlantic seaboard to the shores of the Pacific, and which, notwithstanding changed conditions of life and thought, has grown steadily in the power of moral obligation and become more and more truly the "supreme law" of nearly 100,000,000 people.

As the time was brief, so were the framers few. The convention was composed of 55 members; the Constitution was signed by 39, including Washington; 51 members took part in the debates (according to the most complete report we have of them, the Journal of Madison), again including Washington. It is generally assumed that he took no part in the debates; but Prof. Fiske has said in words which cannot be too often brought before the American citizen:

> It was suggested that palliatives and half measures would be far more likely to find favor with the people than any thorough-going reform, when Washington suddenly interposed with a brief but immortal speech, which ought to be blazoned in letters of gold and posted on the wall of every American assembly that shall meet to nominate a candidate or declare a policy or pass a law, so long as the weakness of human nature shall endure. Rising from his President's chair, his tall figure drawn up to its full height, he exclaimed in tones unwontedly solemn with suppressed emotion: "It is too probable that no plan we propose will be adopted. Perhaps another dreadful conflict is to be sustained. If, to please the people, we offer what we ourselves disapprove, how can we afterward defend our work? Let us raise a standard to which the wise and the honest can repair; the event is in the hand of God."

Some of the 55 took no real part in framing the Constitution, and some were obstructionists. Their objections may have exercised a wholesome influence on the convention, but added much to the cares and perplexities of the greater men who assumed the responsibility and did the work. But whether we take the 39 members who signed the Constitution, or the 51 who took part in the debates, or the 55 who composed the convention, the number seems perilously small to be intrusted with the titanic task of founding for all time a great and growing and intensely active nation. Edmund Randolph, speaking of the time when the Articles of Confederation were framed, apologetically called it "the then infancy of the science of constitutions and of confederacies." He might have said the same of the moment at which he was addressing the convention. Very little did the world then know of the science of constitutions or confederacies! He well summed up the new and added difficulties which confronted the convention, and which it must meet and overcome:

> The inefficiency of requisitions was unknown [to the framers of the Confederation] — no commercial discord had arisen among any States — no rebellion had appeared, as in Massachusetts — foreign debts had not become urgent — the havoc of paper money had not been foreseen — treaties had not been violated; and perhaps nothing better could be obtained, from the jealousy of the States with regard to their sovereignty.

There were other difficulties which Randolph, like a tactful statesman, left unnoticed. At one end of the line of financial troubles Rhode Island stood intent on her great scheme of making fiat paper money the equivalent of gold and silver by imprisoning the citizen who charged more for a commodity in the one kind of money than in the other. At the other end of the line stood New York, with the greatest custom-house of the country, her chief source of revenue, which she would be called upon to surrender to the new Federal government as a part of the price she must pay for coming within the sovereignty of the Constitution. Virginia owned a vast territory which she must cede that it might become the public lands of the United States. Even in the greatness and authority of the men who composed the convention there were dangers and impediments. Three of the greatest proposed things which would have defeated the great work: Franklin, the wisest member of the convention, proposed that the legislative power be vested in a single house, which would have been substantially the House of Representatives; Hamilton, the brilliant genius of the convention, advocated a government of which the President and the senators should hold office during good behavior, that is, for life; Madison, the most sagacious statesman in the convention, would have cast the responsibility of legislation on the judiciary by lodging a veto power in the supreme court. Any one of these provisions would have wrecked the Constitution before it was adopted; and any one of them, if it had been adopted, would have given us a government essentially different from that which we possess.

There is still another extraordinary fact connected with the framing of the Constitution which has received little if any attention, and substantially no comment. In the order of philosophical research the first subject of investigation would be the means or process by which the framers worked. A true philosopher, contemplating the clearness and conciseness of the Constitution, the masterly handling of the chief elements of the future government, the wonderful adaptation of insufficient means to a glorious end, would instantly exclaim, "Such a work is not born of the human mind completed! What was the secret process by which these great inventors attained their grand result"? And the philosopher would find, as he suspected, that even as the Constitution stands alone in the records of constructive statesmanship, so do the means and methods by which the convention did its work. It speaks badly for the century that none of the lesser conventions which have assembled frequently to experiment with

State constitutions has done its work in the same way. In a word, there is nothing which equals the Constitution; there is nothing which approaches the patient, painstaking workmanship of the great convention.

At the beginning, propositions for consideration and discussion were tentatively placed before the convention in an *abstract* form. These propositions were embodied in 15 resolutions, which were immediately referred to the Committee of the Whole. They were taken up one by one, and considered and discussed and amended or rejected or adopted or postponed for later consideration. The abstract of a part of a single day's proceedings will give a clear idea of the way in which the convention worked:

Tuesday, June 5. Mr. Randolph's *ninth* proposition — *The national judiciary to be chosen by the national legislature* — Disagreed to — *To hold office during good behavior and to receive a fixed compensation* — Agreed to — *To have jurisdiction over offenses at sea, captures, cases of foreigners and citizens of different States, of national revenue, impeachment of national officers, and questions of national peace and harmony* — Postponed.

At the end of two weeks of such consideration and discussion (13 June), the Committee of the Whole reported the conclusions which had so far been reached in the form of 19 resolutions. But everything was still abstract and tentative. No line of the Constitution had yet been written; no provision had yet been agreed upon. The 19 resolutions in like manner were taken up, one by one, and in like manner considered and discussed and amended or rejected or adopted or postponed. Other propositions coming from other sources were also considered; and so the work went on until 26 July, when the conclusions of the convention were referred to the Committee of Detail, and the work of reducing the abstract to the concrete began. The convention then adjourned to 6 August, to enable the committee to "prepare and report the Constitution."

On 6 August the Committee of Detail reported and furnished every member with a printed copy of the proposed Constitution. Again the work of consideration began, and went on as before, section by section, line by line. Vexed questions were referred to special committees,— composed of one member from each state,— amendments were offered, changes were made, the Committee on Detail incorporated additional matters in their draught, until, on 8 September, the work of construction stopped. But not even then did the labors of the convention cease. On that day a committee was appointed, "by ballot, to revise the style of, and arrange, the articles which had been agreed to." This committee was afterward known as the Committee of Style. It reported on 12 September, and the work of revision again went on until Saturday, the 15th. On Monday, the 17th, the end was reached, and the members of the convention signed the Constitution. Well might Franklin exclaim in his farewell words to the convention: "It astonishes me, sir, to find the system approaching so near to perfection as it does!" He had been overruled more than once in the convention; provisions which he had proposed had been rejected; provisions which he had opposed had been retained; but he was a great man and saw that a great work had been accomplished.

This article should treat of the Constitutional changes of the century. But the extraordinary fact is that from the framers' point of view there has been, with one trivial exception, absolutely no change in the Constitution of the United States. "Are there not 15 amendments," it will be asked, and "do not the presidential electors vote for a President and Vice-President in a different way, and is there not an unwritten change in the Constitution by virtue of which the selection of Presidents has passed directly to the people, acting through their political national conventions?" All these questions may be answered generally in the affirmative; and yet the fact remains that from the framers' point of view there has been, with one trivial exception, absolutely no change in the Constitution of the United States.

The work of the great convention was the making of a government; and the government which the framers made has remained absolutely unchanged. Madison, who was a wary as well as sagacious statesman, carried the first ten amendments through the first Congress at the first session to assuage public excitement and strengthen the new government and close the mouths of those who railed against it. He introduced into the tenth amendment a rule of construction which would not have been adopted by the convention, a clause which politically has made much mischief during these one hundred years, but which under the necessities of judicial construction has amounted to nothing, namely, that powers not delegated or prohibited by the Constitution "are reserved to the States respectively or to the people." The other provisions of the ten amendments are little more than quotations from the Bill of Rights. The constitution contained but few such declarations: that the writ of habeas corpus shall not be suspended; that no bill of attainder or *ex post facto* law shall be passed; that the trial of all crimes shall be by jury; that such trials shall be in the State where the crime was committed; that no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted. The ten amendments declare that Congress shall make no law respecting an establishment of religion or prohibiting the free exercise thereof, or abridge the freedom of speech, or the right of the people peacefully to assemble and petition the government for a redress of grievances, etc. (Article 1). They provide that no person shall be compelled to be a witness against himself, nor be deprived of life, liberty, or property without due process of law; nor shall private property be taken for public use without just compensation, etc. (Article 5). These are great principles and noble sentiments, but their efficacy depends upon the rectitude of the government and the vigor and integrity of the people. No Congress would ever have dared to "make a law respecting an establishment of religion," though there had been no Constitutional prohibition; and many an unfortunate citizen has lived and died with his claim for property taken for public use still unpaid, notwithstanding the Constitutional guaranty of "just compensation." In a word, the ten amendments served their temporary purpose; they have doubtless warned off Congress occasionally when in the heedlessness of the short session or in the heat of political excitement a legislative wrong might otherwise have been

done; they have in a few instances secured the individual citizen, judicially, in his natural right to life, liberty, or property; they continue to be a standing moral restraint upon the legislative and executive branches of the government; and they form a noble decalogue of great principles to be kept before the eyes of all American citizens; but, nevertheless, the judicial records of the century show that the government which the framers of the Constitution established would have moved on just as it has done, if these ten amendments had never been proposed. The conscience and intelligence of the country have been the real safeguards of the citizen against injustice and oppression.

The Eleventh Amendment was caused by the extreme ground taken by the early supreme court in Chisholm *v.* Georgia (2 Dall., R. 419), and the incipient rebellion of that State. Its purpose was to overrule that decision and to exempt a State from suit by a citizen. If Marshall had been upon the bench the decision would never have been made; and, singularly, it was overruled by the same court a hundred years afterward (Hans *v.* Louisiana, 134 U. S. R. 1). The Thirteenth, Fourteenth, and Fifteenth Amendments grew out of the Civil War. They abolished slavery; they impose restraints upon State governments; they confer on some persons constitutional rights; they guarantee certain rights, privileges, and immunities to citizens and persons; and they contain some provisions relating to representation in Congress. Much litigation has been caused by them; some statutes have been held constitutional and some unconstitutional; a larger proportion of representation has fallen to the Southern States; the guaranty given to all citizens of the right to vote without regard to "race, color, or previous condition of servitude" is not absolutely effective, and the government of the United States moves on precisely as it did before.

It has been said herein that from the point of view of the framers of the Constitution their work has been changed in only one trifling particular. That change relates to the election of President, and was effected by the Twelfth Amendment. Under the Constitution as it originally stood each elector voted for two persons for President. He who should have the greatest number of votes would become President; he who might come next would be Vice-President. Under this provision, Mr. Lincoln, in 1861, would have become President, and Mr. Seward Vice-President. That is to say, the Republican electors, following the direction of their party, as expressed by the national convention, would have cast all their votes for Mr. Lincoln, and all but one for Mr. Seward. The purpose of the framers was a wise one: to secure for the country the two strongest statesmen of the party constituting for the time being the majority of the people, to fill the offices of President and Vice-President. No better plan could have been devised for obtaining a strong executive. We see a weak and modified application of the principle in national conventions when the defeated "wing of the party" is placated by being allowed to designate the candidate for Vice-President. But in 1801 there had been a tie, whereby the electors had failed to elect, and the election had gone into the House. If it had not been for that mishap, the Twelfth Amendment would not now exist; and if the original system had survived until the time of rapid communication by railroad and telegraph and better party organization, it is safe to say that it would now be in unquestioned operation. Political conventions would long ago have adopted its leading principle, and the struggle would have been as to which of the two strongest candidates should be first or second upon the ticket. The system would have given greater dignity to the office of Vice President, and would have brought the possible importance of that office always before the eyes of the citizen. But whether we think well or ill of the original method, one thing is certain, that the only change made by the Twelfth Amendment is a trivial one of administrative detail. After all the changes this country has passed through in the last hundred years — changes in civilization, of territory, of population, of ideas, education, and public convictions, and individual life — changes such as the world has never witnessed in one country or in one century, the only change made in the Constitution has been the paltry one of having the electoral vote cast in one form instead of in another.

The unwritten amendment of the Constitution, as it has been called, also relates to the selection of the President. It is said by some of the commentators, and indeed it is now generally believed, that the electoral colleges were intended to be "deliberative bodies." In one sense this is true — in the legal sense. The electors are not ministerial or administrative officers; they do not perform a specific work in a way determined by higher official authority; in legal contemplation the responsibility of their action rests upon themselves. But the framers of the Constitution never supposed that the electors would disregard the political pledges upon which they were chosen, or that the American people, either directly or through their State legislatures, would blindly choose electors to evolve a President out of their inner consciousness. On the contrary, they contemplated the successful candidates receiving the votes of "a majority of the whole number of electors," and they required the electors to vote "in their respective States," and to vote on the same day. If they had framed a provision requiring all of the electors to convene at the seat of the government in one body, and there in their own way and time proceed to choose a President, there would be good reason for saying that actual deliberation was intended; but they did not give to the electors one single power or attribute by virtue of which they could deliberate.

That very thing was attempted and the attempt failed. The question before the convention was, in effect: "Where shall the deliberative power to choose the President be vested when the formal casting and counting of the electoral vote fails to elect?" The answering propositions were, "In the Senate," or "In the House of Representatives." Then Spaight, of North Carolina, said that "he would prefer their [the electors] meeting altogether [all together] and *deciding finally*"; and he moved "*that the electors meet at the seat of the general government*"; and all of the States except North Carolina voted against it. The evidence is therefore both negative and positive — the convention did not invest the electors with the

necessary powers and means for deliberation, and positively refused to do so; and refusal is conclusive of non-intent.

The idea that it was ever intended that the electors should nominate the candidate for whom they themselves should vote is a myth which has been unthinkingly reiterated by most eminent writers, but which does not rest upon a single fact. Nothing perplexed the convention more than the subject of the executive. Plan after plan was weighed and found wanting. The electoral system was late in coming to the front, and was the solvent of many difficulties. Hamilton early foresaw the inevitable, and proposed that "the selection be made by electors chosen by the people." Madison, later, said that the option before the convention "lay between an appointment by electors chosen by the people and an immediate appointment by the people"; and he at the same time said that "the electors would be chosen *for the occasion*, would meet *at once*, and proceed *immediately* to an appointment." It was as well understood then as it is now that they would but register the decree of the political power which appointed them. The internal evidence of intent is even more conclusive. He who supposes that the framers intended *that thirteen different bodies should convene in thirteen different places at one time for one object and for one day, and that object the selection of the executive of a nation*, confesses a most superficial knowledge of the greatest constructive statesmen of their century and of the great work which they deliberately planned and built.

And what better could the framers of the Constitution have done? Wilson, who proposed "an election by the people," was "almost unwilling to declare the mode which he wished to take place, being apprehensive that it might appear chimerical." Gerry, "who liked the principle," "thought the community not yet ripe"; he "was for waiting till the people should feel more the necessity of it." Gouverneur Morris admitted "that difficulties attended this mode," but thought that they would be "found superable." Madison liked an election by the people best, but acknowledged "the disadvantage this would throw on the smaller States." Ellsworth declared "the objection drawn from the different sizes of the States unanswerable."

It has been a fashion of late to speak of the electoral system as curious machinery which may give rise to serious complications; but viewed amid the difficulties and conditions and limitations of 1787, there is no stroke of practical statesmanship in the Constitution more wise and ingenious. The choosing of candidates soon drifted into Congress; with the coming of the steamboat and the railroad it passed from the congressional caucus to national conventions; and yet, notwithstanding these radical changes of usage, the expansion of territory, the multiplication of States, and the unscrupulousness of political partisanship, there have been no more mishaps than are incident to any system of human device.

To foretell the future of the Constitution is to foretell the future of the American people. They will change before it is changed. As with Washington and Lincoln, the more we know of them the better they appear; so of the Constitution, the more we contemplate its trials the better it appears adapted to our national needs. With the growth of knowledge there has been a growth of reverence. The people will experiment with State constitutions and tear them up and experiment again, but when it comes to the Constitution — the great Constitution — there is a sturdy sentiment of "hands off," and that sentiment is incomparably stronger now than it was at the beginning of the century. Judicial construction has moved backward rather than forward, and where Marshall left it it stands, substantially, to-day.

The amendatory provision of the Constitution is an unbarred door which may be opened at any time. It was wise and prudent of the framers to leave it thus unlocked. But he who tries to swing open that door will find two things of which he did not reckon: first, a *vis inertia* in the ignorance and indifference of congressmen — in their doubts whether the amendments will be popular — in their absorption in lesser things; and, second, that there is always some one on the other side pressing back the door.

At this time there is an amendment pending to have senators elected directly by the people. It is a popular amendment, and yet is absolutely needless. The men who framed the Constitution constructed it of general principles, and left it flexible for administrative details. Long ago, Abraham Lincoln and Stephen A. Douglas were senatorial candidates, and were as directly candidates before the people of Illinois as Mr. Gladstone and Lord Beaconsfield ever were before the people of England; and the legislature of Illinois carried into effect the public will. During the past year the people of North Carolina have nominated a candidate for senator by what is termed a "direct primary," and the legislature of North Carolina will give effect to their will. When the people of the United States find that it is easier to instruct the delegates they send to State conventions to proceed and nominate a candidate for United States senator than to obtain an amendment to the Constitution, the election of senators by the people will in practical effect take place.

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Chief Justice Court of Claims.

Constitution of the United States, the governing instrument of the United States of America, adopted in 1787, when it took the place of the Articles of Confederation. (For details of its adoption see CONSTITUTION, FRAMING OF THE.) Political discussion of the time played a much greater part in the compromises of this instrument than its provisions in turn exerted on political history in the following period, which to a surprising degree may be attached to only two clauses of the instrument and to these two simply because of their vagueness, and their mutually contradictory nature. Section 8 (18) in defining the powers of Congress adds the blanket provision of power, "To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof." The second historic clause occurs in the Amendments, where Article X reads: "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." The

former is the famous elastic clause. In this accommodating provision interpreted radically, or conservatively, in the light of the Tenth Amendment all shades of political theory find proof-texts for their peculiar doctrines. So immediately upon the formation of the new government two political parties arose, the Democratic-Republican party, strict constructionists of the elastic clause, who limited the powers of Congress to the minimum and exalted State rights to the maximum, and the Federalist party in favor of a highly centralized government doing everything possible for and in the States. Around this fundamental difference may be grouped the great political questions up to and culminating in the Civil War, and to a less degree recent political discussions are based upon the same variance in interpretation of the Constitution, although neither party now holds to the strict construction theory as it was set forth by the early opponents of the Federalists. This change has been brought about very largely by practical experience of affairs, it being well known that the foremost strict constructionists who have come to the presidential chair were forced by the exigencies of administration to a broader exposition of the clause. This was notably the case in the administrations of Jefferson and of his immediate lieutenants and successors.

The text of the Constitution follows:

CONSTITUTION OF THE UNITED STATES

We the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America.

ARTICLE I

Section 1. All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives.

Section 2. 1 The House of Representatives shall be composed of members chosen every second year by the people of the several States, and the electors in each State shall have the qualifications requisite for electors of the most numerous branch of the State legislature.

2 No person shall be a representative who shall not have attained to the age of twenty-five years, and been seven years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State in which he shall be chosen.

3 Representatives and direct taxes shall be apportioned among the several States which may be included within this Union, according to their respective numbers, which shall be determined by adding to the whole number of free persons, including those bound to service for a term of years, and, excluding Indians not taxed, three fifths of all other persons. The actual enumeration shall be made within three years after the first meeting of the Congress of the United States, and within every subsequent term of ten years, in such manner as they shall by law direct. The number of representatives shall not exceed one for every thirty thousand, but each State shall have at least one representative; and until such enumeration shall be made, the State of New Hampshire shall be entitled to choose three, Massachusetts eight, Rhode Island and Providence Plantations one, Connecticut five, New York six, New Jersey four, Pennsylvania eight, Delaware one, Maryland six, Virginia ten, North Carolina five, South Carolina five, and Georgia three.

4 When vacancies happen in the representation from any State, the executive authority thereof shall issue writs of election to fill such vacancies.

5 The House of Representatives shall choose their speaker and other officers, and shall have the sole power of impeachment.

Section 3. 1 The Senate of the United States shall be composed of two senators from each State, chosen by the legislature thereof for six years; and each senator shall have one vote.

2 Immediately after they shall be assembled in consequence of the first election, they shall be divided as equally as may be into three classes. The seats of the senators of the first class shall be vacated at the expiration of the second year, of the second class at the expiration of the fourth year, and of the third class at the expiration of the sixth year, so that one third may be chosen every second year; and if vacancies happen by resignation, or otherwise, during the recess of the legislature of any State, the executive thereof may make temporary appointments until the next meeting of the legislature, which shall then fill such vacancies.

3 No person shall be a senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State for which he shall be chosen.

4 The Vice President of the United States shall be President of the Senate, but shall have no vote, unless they be equally divided.

5 The Senate shall choose their other officers, and also a president *pro tempore*, in the absence of the Vice President, or when he shall exercise the office of President of the United States.

6 The Senate shall have the sole power to try all impeachments. When sitting for that purpose, they shall be on oath or affirmation. When the President of the United States is tried, the chief justice shall preside: and no person shall be convicted without the concurrence of two thirds of the members present.

7 Judgment in cases of impeachment shall not extend further than to removal from office, and disqualification to hold and enjoy any office of honor, trust or profit under the United States: but the party convicted shall nevertheless be liable and subject to indictment, trial, judgment and punishment, according to law.

Section 4. 1 The times, places, and manner of holding elections for senators and representatives, shall be prescribed in each State by the legislature thereof; but the Congress may at any time by law make or alter such regulations, except as to the places of choosing senators.

2 The Congress shall assemble at least once in every year, and such meeting shall be on the first Monday in December, unless they shall by law appoint a different day.

Section 5. 1 Each House shall be the judge of the elections, returns and qualifications of its own members, and a majority of each shall constitute a quorum to do business; but a smaller number may adjourn from day to day, and may be authorized to compel the attendance of absent members, in such manner, and under such penalties as each House may provide.

2 Each House may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two thirds, expel a member.

3 Each House shall keep a journal of its proceedings, and from time to time publish the same, excepting such parts as may in their judgment require secrecy; and the yeas and nays of the members of either House on any question shall, at the desire of one fifth of those present, be entered on the journal.

4 Neither House, during the session of Congress, shall, without the consent of the other, adjourn for more than three days, nor to any other place than that in which the two Houses shall be sitting.

Section 6. 1 The senators and representatives shall receive a compensation for their services, to be ascertained by law, and paid out of the Treasury of the United States. They shall in all cases, except treason, felony and breach of the peace, be privileged from arrest during their attendance at the session of their respective Houses, and in going to and returning from the same; and for any speech or debate in either House, they shall not be questioned in any other place.

2 No senator or representative shall, during the time for which he was elected, be appointed to any civil office under the authority of the United States, which shall have been created, or the emoluments whereof shall have been increased during such time; and no person holding any office under the United States shall be a member of either House during his continuance in office.

Section 7. 1 All bills for raising revenue shall originate in the House of Representatives; but the Senate may propose or concur with amendments as on other bills.

2 Every bill which shall have passed the House of Representatives and the Senate, shall, before it become a law, be presented to the President of the United States; if he approve he shall sign it, but if not he shall return it, with his objections to that House in which it shall have originated, who shall

enter the objections at large on their journal, and proceed to reconsider it. If after such reconsideration two thirds of that House shall agree to pass the bill, it shall be sent, together with the objections, to the other House, by which it shall likewise be reconsidered, and if approved by two thirds of that House, it shall become a law. But in all such cases the votes of both Houses shall be determined by yeas and nays, and the names of the persons voting for and against the bill shall be entered on the journal of each House respectively. If any bill shall not be returned by the President within ten days (Sundays excepted) after it shall have been presented to him, the same shall be a law, in like manner as if he had signed it, unless the Congress by their adjournment prevent its return, in which case it shall not be a law.

3 Every order, resolution, or vote to which the concurrence of the Senate and House of Representatives may be necessary (except on a question of adjournment) shall be presented to the President of the United States; and before the same shall take effect, shall be approved by him, or being disapproved by him, shall be repassed by two thirds of the Senate and House of Representatives, according to the rules and limitations prescribed in the case of a bill.

SECTION 8. 1 The Congress shall have power to lay and collect taxes, duties, imposts and excises, to pay the debts and provide for the common defense and general welfare of the United States; but all duties, imposts and excises shall be uniform throughout the United States;

2 To borrow money on the credit of the United States;

3 To regulate commerce with foreign nations, and among the several States, and with the Indian tribes;

4 To establish an uniform rule of naturalization, and uniform laws on the subject of bankruptcies throughout the United States;

5 To coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures;

6 To provide for the punishment of counterfeiting the securities and current coin of the United States;

7 To establish post offices and post roads;

8 To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries;

9 To constitute tribunals inferior to the Supreme Court;

10 To define and punish piracies and felonies committed on the high seas, and offenses against the law of nations;

11 To declare war, grant letters of marque and reprisal, and make rules concerning captures on land and water;

12 To raise and support armies, but no appropriation of money to that use shall be for a longer term than two years;

13 To provide and maintain a navy;

14 To make rules for the government and regulation of the land and naval forces;

15 To provide for calling forth the militia to execute the laws of the Union, suppress insurrections and repel invasions;

16 To provide for organizing, arming, and disciplining the militia, and for governing such part of them as may be employed in the service of the United States, reserving to the States respectively the appointment of the officers, and the authority of training the militia according to the discipline prescribed by Congress;

17 To exercise exclusive legislation in all cases whatsoever, over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress, become the seat of the government of the United States, and to exercise like authority over all places purchased by the consent of the legislature of the State in which the same shall be, for the erection of forts, magazines, arsenals, dockyards, and other needful buildings; and

18 To make all laws which shall be necessary and proper for carrying into execution the foregoing powers, and all other powers vested by this Constitution in the government of the United States, or in any department or officer thereof.

SECTION 9. 1 The migration or importation of such persons as any of the States now existing shall think proper to admit, shall not be prohibited by the Congress prior to the year one thousand eight hundred and eight, but a tax or duty may be imposed on such importation, not exceeding ten dollars for each person.

2 The privilege of the writ of *habeas corpus* shall not be suspended, unless when in cases of rebellion or invasion the public safety may require it.

3 No bill of attainder or *ex post facto* law shall be passed.

4 No capitation, or other direct, tax shall be laid, unless in proportion to the census or enumeration hereinbefore directed to be taken.

5 No tax or duty shall be laid on articles exported from any State.

6 No preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another: nor shall vessels bound to, or from, one State be obliged to enter, clear, or pay duties in another.

7 No money shall be drawn from the treasury, but in consequence of appropriations made by law; and a regular statement and account of the receipts and expenditures of all public money shall be published from time to time.

8 No title of nobility shall be granted by the United States: and no person holding any office of profit or trust under them, shall, without the consent of the Congress, accept of any present, emolument, office, or title, of any kind whatever, from any king, prince, or foreign State.

SECTION 10. 1 No State shall enter into any treaty, alliance, or confederation; grant letters of marque and reprisal; coin money; emit bills of credit; make anything but gold and silver coin a tender in payment of debts; pass any bill of attainder, *ex post facto* law, or law impairing the obligation of contracts, or grant any title of nobility.

2 No State shall, without the consent of the Congress, lay any imposts or duties on imports or exports, except what may be absolutely necessary for executing its inspection laws: and the net produce of all duties and imposts laid by any State on imports or exports, shall be for the use of the treasury of the United States; and all such laws shall be subject to the revision and control of the Congress.

3 No State shall, without the consent of Congress, lay any duty of tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay.

ARTICLE II

SECTION 1. 1 The executive power shall be vested in a President of the United States of America. He shall hold his office during the term of four years, and, together with the Vice President, chosen for the same term, be elected, as follows

2 Each State shall appoint, in such manner as the legislature thereof may direct, a number of electors, equal to the whole number of senators and representatives to which the State may be entitled in the Congress: but no senator or representative, or person holding an office of trust or profit under the United States, shall be appointed an elector.

The electors shall meet in their respective States, and vote by ballot for two persons, of whom one at least shall not be an inhabitant of the same State with themselves. And they shall make a list of all the persons voted for, and of the number of votes for each; which list they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the president of the Senate. The president of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates, and the votes shall then be counted. The person having the greatest number of votes shall be the President, if such number be a majority of the whole number of electors appointed; and if there be more than one who have such majority, and have an equal number of votes, then the House of Representatives shall immediately choose by ballot one of them for President; and if no person have a majority, then from the five highest on the list the said house shall in like manner choose the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two thirds of the States, and a majority of all the States shall be necessary to a choice. In every case, after the choice of the President, the person having the greatest number of votes of the electors shall be the Vice President. But if there should remain two or more who have equal votes, the Senate shall choose from them by ballot the Vice President.

3 The Congress may determine the time of choosing the electors, and the day on which they shall give their votes; which day shall be the same throughout the United States.

4 No person except a natural born citizen, or a citizen of the United States, at the time of the adoption of this Constitution, shall be eligible to the office of President; neither shall any person be eligible to that office who shall not have attained to the age of thirty-five years, and been fourteen years a resident within the United States.

5 In case of the removal of the President from office, or of his death, resignation, or inability to discharge the powers and duties of the said office, the same shall devolve on the Vice President, and the Congress may by law provide for the case of removal, death, resignation, or inability, both of the President and Vice President, declaring what officer shall then act as President, and such officer shall act accordingly, until the disability be removed, or a President shall be elected.

6 The President shall, at stated times, receive for his services a compensation, which shall neither be increased nor diminished during the period for which he shall have been elected, and he shall not receive within that period any other emolument from the United States, or any of them.

7 Before he enter on the execution of his office, he shall take the following oath or affirmation: — "I do solemnly swear (or affirm) that I will faithfully execute the office of President of the United States, and will to the best of my ability, preserve, protect and defend the Constitution of the United States."

SECTION 2. 1 The President shall be commander in chief of the army and navy of the United States, and of the militia of the several States, when called into the actual service of the United States; he may require the opinion, in writing, of the principal officer in each of the executive departments, upon any subject relating to the duties of their respective offices, and he shall have power to grant reprieves and pardons for offenses against the United States, except in cases of impeachment.

2 He shall have power, by and with the advice and consent of the Senate, to make treaties, provided two thirds of the senators present concur; and he shall nominate, and by and with the advice and consent of the Senate, shall appoint ambassadors, other public ministers and consuls, judges of the Supreme Court, and all other officers of the United States, whose appointments are not herein otherwise provided for, and which shall be established by law: but the Congress may by law vest the appointment of such inferior officers, as they think proper, in the President alone, in the courts of law, or in the heads of departments.

3 The President shall have power to fill up all vacancies that may happen during the recess of the Senate, by granting commissions which shall expire at the end of their next session.

SECTION 3. He shall from time to time give to the Congress information of the state of the Union, and recommend to their consideration such measures as he shall judge necessary and expedient; he may, on extraordinary occasions, convene both Houses, or either of them, and in case of disagreement between them with respect to the time of adjournment, he may adjourn them to such time as he shall think proper; he shall receive ambassadors and other public ministers; he shall take care that the laws be faithfully executed, and shall commission all the officers of the United States.

SECTION 4. The President, Vice President, and all civil officers of the United States, shall be removed from office on impeachment for, and conviction of, treason, bribery, or other high crimes and misdemeanors.

ARTICLE III

SECTION 1. The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time ordain and establish. The judges, both of the Supreme and inferior courts, shall hold their offices during good behavior, and shall, at stated times, receive for their services, a compensation which shall not be diminished during their continuance in office.

SECTION 2. 1 The Judicial power shall extend to all cases, in law and equity, arising under this Constitution, the laws of the United States, and treaties made, or which shall be made, under their authority; — to all cases affecting ambassadors, other public ministers and consuls; — to all cases of admiralty and maritime jurisdiction; — to controversies to which the United States shall be a party; — to controversies between two or more States; — between a State and citizens of another State; — between citizens of different States, — between citizens of the same State claiming lands under grants of different States, and between a State, or the citizens thereof, and foreign States, citizens or subjects.

2 In all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned, the Supreme Court shall have appellate jurisdiction, both as to law and fact, with such exceptions, and under such regulations as the Congress shall make.

3 The trial of all crimes, except in cases of impeachment, shall be by jury; and such trial shall be held in the State where the said crimes shall have been committed; but when not committed within any State, the trial shall be at such place or places as the Congress may by law have directed.

SECTION 3. 1 Treason against the United States, shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act, or on confession in open court.

2 The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood, or forfeiture except during the life of the person attainted.

ARTICLE IV

SECTION 1. Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State. And the Congress may by general laws prescribe the manner in which such acts, records and proceedings shall be proved, and the effect thereof.

SECTION 2. 1 The citizens of each State shall be entitled to all privileges and immunities of citizens in the several States.

2 A person charged in any State with treason, felony, or other crime, who shall flee from justice, and be found in another State, shall on demand of the executive authority of the State from which he fled, be delivered up to be removed to the State having jurisdiction of the crime.

3 No person held to service or labor in one State, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due.

SECTION 3. 1 New States may be admitted by the Congress into this Union; but no new States shall be formed or erected within the jurisdiction of any other State; nor any State be formed by the junction of two or more States, or parts of States, without the consent of the legislatures of the States concerned as well as of the Congress.

2 The Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States; and nothing in this Constitution shall be so construed as to prejudice any claims of the United States, or of any particular State.

SECTION 4. The United States shall guarantee to every State in this Union a republican form of government, and shall protect each of them against invasion; and on application of the legislature, or of the executive (when the legislature cannot be convened) against domestic violence.

ARTICLE V

The Congress, whenever two thirds of both Houses shall deem it necessary, shall propose amendments to this Constitution, or, on the application of the legislatures of two thirds of the several States, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this Constitution, when ratified by the legislatures of three fourths of the several States, or by conventions in three fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; Provided that no amendment which may be made prior to the year one thousand eight hundred and eight shall in any manner affect the first and fourth clauses in the ninth section of the first article; and that no State, without its consent, shall be deprived of its equal suffrage in the Senate.

ARTICLE VI

1 All debts contracted and engagements entered into, before the adoption of this Constitution, shall be as valid against the United States under this Constitution, as under the Confederation.

2 This Constitution, and the laws of the United States which shall be made in pursuance thereof; and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every State shall be bound thereby, anything in the Constitution or laws of any State to the contrary notwithstanding.

3 The senators and representatives before mentioned, and the members of the several State legislatures, and all executive and judicial officers, both of the United States, and of the several States, shall be bound by oath or affirmation to support this Constitution; but no religious test shall ever be required as

a qualification to any office or public trust under the United States.

ARTICLE VII

The ratification of the conventions of nine States shall be sufficient for the establishment of this Constitution between the States so ratifying the same.

Done in Convention by the unanimous consent of the States present the seventeenth day of September in in the year of our Lord one thousand seven hundred and eighty-seven, and of the independence of the United States of America the twelfth. In witness whereof we have hereunto subscribed our names,

Go: Washington —
Presidt. and Deputy from Virginia

New Hampshire

John Langdon
Nicholas Gilman

Massachusetts

Nathaniel Gorham
Rufus King

Connecticut

Wm. Saml. Johnson
Roger Sherman

New York

Alexander Hamilton

New Jersey

Wil: Livingston
David Brearley
Wm. Paterson
Jona: Dayton

Pennsylvania

B. Franklin
Thomas Mifflin
Robt. Morris
Geo. Clymer
Thos. Fitzsimons
Jared Ingersoll
James Wilson
Gouv Morris

Delaware

Geo: Read
Gunning Bedford Jun
John Dickinson
Richard Bassett
Jaco: Broom

Maryland

James McHenry
Dan of St. Thos. Jenifer
Danl. Carroll

Virginia

John Blair —
James Madison Jr.

North Carolina

Wm. Blount
Richd. Dobbs Spaight
Hu Williamson

South Corolina

J. Rutledge,
Charles Cotesworth Pinckney
Charles Pinckney
Pierce Butler

Georgia

William Few
Abr Baldwin

Attest William Jackson Secretary.

Articles in addition to, and amendment of, the Constitution of the United States of America, proposed by Congress, and ratified by the legislatures of the several States pursuant to the fifth article of the original Constitution.

ARTICLE I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the government for a redress of grievances.

ARTICLE II

A well regulated militia, being necessary to the security of a free State, the right of the people to keep and bear arms, shall not be infringed.

ARTICLE III

No soldier shall, in time of peace be quartered in any house, without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.

ARTICLE IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

ARTICLE V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a grand jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation.

ARTICLE VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

ARTICLE VII

In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise reëxamined in any court of the United States, than according to the rules of the common law.

ARTICLE VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

ARTICLE IX

The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people.

ARTICLE X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

ARTICLE XI

The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by citizens of another State, or by citizens or subjects of any foreign State.

ARTICLE XII

The electors shall meet in their respective States, and vote by ballot for President and Vice President, one of whom, at least, shall not be an inhabitant of the same State with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice President, and they shall make distinct lists of all persons voted for as President and for all persons voted for as Vice President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of government of the United States, directed to the president of the Senate;— The president of the Senate shall, in presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted; — The person having the greatest number of votes for President shall be the President, if such number be a majority of the whole number of electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two thirds of the States, and a majority of all the States shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice President shall act as President, as in the case of the death or other constitutional disability of the President. The person having the greatest number of votes as Vice President shall be the Vice President, if such number be a majority of the whole number of electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice President; a quorum for the purpose shall consist of two thirds of the whole number of senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice President of the United States.

ARTICLE XIII

SECTION 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.

SECTION 2. Congress shall have power to enforce this article by appropriate legislation.

ARTICLE XIV

SECTION 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States, nor shall any State deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

SECTION 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, representatives in Congress, the executive and judicial officers of a State, or the members of the legislature thereof, is denied to any of the male inhabitants of such State, being twenty-one years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens twenty-one years of age in such State.

SECTION 3. No person shall be a senator or representative in Congress or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may by a vote of two thirds of each House, remove such disability.

SECTION 4. The validity of the public debt of the United States, authorized by law, including debts incurred for payment of pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations and claims shall be held illegal and void.

SECTION 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

ARTICLE XV

SECTION 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude.

SECTION 2. The Congress shall have power to enforce this article by appropriate legislation.

Constitutional Amendments, History of. As shown in a preceding article (see CONSTITUTION, FRAMING OF THE), very few of the States liked the Constitution as a form of government at all, and fewer still were satisfied with it as an instrument. North Carolina had refused to ratify without amendments and a "bill of rights" affixed — a declaration of the fundamental rights of human beings to which immense importance was attached by the mass at that time; Massachusetts and New Hampshire ratified with an appended urgent recommendation of certain amendments; New York first ratified subject to the right to secede if her amendments were not accepted within six years, and finally changed "on condition" to "in full confidence." The mass of amendments proposed in the first Congress was enormous; 103 from the States themselves, and 42 from minorities in other States, besides long bills of rights from New York and Virginia. Some of them were duplicates, but the total was very great; the House rejected them all and agreed on 17 articles in their place. The Senate cut them down to 12 and both Houses passed them; the first two failed of ratification by the States, the remaining 10 were accepted and went into force 15 Dec. 1791.

The text of the Amendments is to be found with the body of the Constitution.

The First Amendment (Article I.) was violated by the government within a few years in the Sedition Act (see ALIEN AND SEDITION ACTS), and had no effect in accomplishing its defeat, which was effected by a party revolution. Nor has it prevented "gag laws," or exclusion from the mails of whatever has been thought obnoxious. Public opinion in these respects has been found more efficient than the Constitution.

General warrants were a principal grievance of the British customs laws, a fact which explains Article IV.

"Life *or limb*" in Article V. is a curious anachronism; modern laws do not prescribe the rack as a punishment. Probably the drafters of this provision used a current phrase without stopping to analyze its meaning.

The provision of Article VI. against changing the venue was doubtless suggested by the attempts to take Americans to England for trial.

The intrepid jumble of possible and impossible dangers of Articles VII.–X., inclusive, reminiscences of 17th-century persecutions and 18th-century customs laws, of the times of King John and those of George III., of grievances unthinkable except under foreign rule and of others likely enough under their own, of local provisions and world-wide provisions, is amusingly characteristic of the period and the people; perhaps rather, any period and any people. The Amendments inspired the champions of a strong government with great weariness and disgust; but they are not all anachronisms or idle precautions. The Tenth especially (added by Massachusetts) has in practice restrained the action of the government greatly, especially in guiding the constructions of the supreme court; and certain provisions of the Fifth, Sixth, and Seventh have been great public safeguards, by no means out of date even yet.

See CHISHOLM V. GEORGIA, for the circumstances under which the Eleventh Amendment, put in force 8 Jan. 1798, was passed. Maryland had been sued by a private citizen, and submitted; Georgia was sued, refused to plead, and threatened with death any one who served a writ in the suit; and she and Virginia pressed through an amendment forbidding such suits by individuals against States, but not *vice versa*.

The gist of Article XII. is the naming of the candidates for President and Vice-President separately; the lack of which provision brought about a discreditable intrigue, and results political and personal by no means forgotten. (See ELECTORAL SYSTEM; JEFFERSON-BURR IMBROGLIO.) Before this, the highest candidate was President and the next highest Vice-President; but now came an election which showed not merely the possibility of a tie, but the certainty of one, between the two candidates of the same party from mere party loyalty. Yet plain as this seems, the Amendment failed in the first Congress where it was introduced,

passed the House 12 Dec. 1803, only by the Speaker's casting vote, was ratified by the bare three fourths of the States necessary, and declared in force 25 Sept. 1804. New Hampshire, Massachusetts, Connecticut, and Delaware (Federalist States) rejected it.

The emancipation proclamation had freed only the slaves within the States technically in revolt. In those where the Union forces alone had prevented it, as Maryland, or a powerful minority of Union men plus resolute Union commanders, as Missouri, and generally in the Border States, the slaves were still private property, nearly 1,000,000 in number. Movements to compensate the owners were abortive, partly because the owners would not listen to such proposals; and the Thirteenth Amendment was introduced for entire emancipation without payment. Its phraseology is essentially that of the Ordinance of 1787 (q.v.), repeated in the Missouri Compromise and the Wilmot Proviso (qq.v.). It passed the Senate 8 April 1864, 38 to 6, and the House 15 June 95 to 66, but the latter was not the needed two thirds. In the next session the House passed it, and it was ratified by 31 States, and proclaimed in force 18 Dec. 1865.

The Fourteenth Amendment, in part a rephrasing of the Fifth, arose out of the first Civil Rights Bill (q.v.), which was pronounced nonenforceable as contrary to the decision of the supreme court in the Dred Scott Case (q.v.), that negroes were not citizens. As this decision was law until distinctly reversed, the Amendment was drawn, the first clause clearing away that decision. The other sections were: (1) A bribe to the South to give the negro the vote; (2) to give the negroes a clear field by debarring the Confederate leaders from it; (3) obvious. It passed both houses in June 1866, by overwhelming votes, but a long struggle ensued over ratification. The old Confederate States rejected it, to which Congress retorted by the Reconstruction Act of 2 March 1867, constituting provisional governments in those States till they had ratified the Amendment, and they did so. Maryland, Delaware, and Kentucky also rejected it; and New Jersey and Ohio were captured by the Democrats and rescinded their ratifications, though it was doubtful whether this could be done. But finally 33 States ratified without them, and the Amendment was declared in force 28 July 1868.

The Fifteenth Amendment was practically a substitute for the second section of the Fourteenth, which was found valueless. In one respect it was weaker than the other, which prescribed a penalty for the offense, while this prescribed none; but its specification of the negroes as the class not to be excluded, and their race or color or former slavery as not legal grounds for disfranchisement, gave it apparently a clearer legal footing. In fact, however, it has been found as little worth as the other. It passed both Houses in February 1869, by immense majorities, was ratified by 30 out of 37 States, and declared in force 30 March 1870. New York fell into the hands of the Democrats and rescinded its vote; a notice was filed in the State Department, which reported that the State "claimed" to have rescinded its ratification, but paid no further attention to it. It is more than doubtful if such action of a State has the least validity.

Constitutions, State, First Formation of. The colonies at the Revolution were living under a great variety of governmental instruments, and some of them under none. For example, New Hampshire and Delaware were not separate colonies by any formal grant or charter; the former existed only by the royal will, and was a semi-appendage of Massachusetts, the two often having the same governor; the latter was in theory only three counties of Pennsylvania, and had always the same governor. Pennsylvania and Delaware had proprietary governments: New Jersey a crown government, but the old proprietary instrument of government, "the Concessions"; Massachusetts, New York, Virginia, the Carolinas, and Georgia, crown governments and royal charters; Connecticut and Rhode Island pure self-governing charters. All of course had the rights of English freemen, and popular assemblies. When the Revolution broke out, these instruments, except in the last two cases, and measurably in Massachusetts, would no longer serve for the new needs as members of an independent republic, and must have great modification or entire reconstruction. New Hampshire, living on sufferance with no government at all, was naturally the first to act, adopting a constitution 5 Jan. 1776; South Carolina followed 26 March; Virginia 29 June; New Jersey 2 July; Delaware 21 September, seizing the opportunity for independence; Pennsylvania 28 September; Maryland 11 November; North Carolina 18 December; Georgia 5 Feb. 1777; New York 20 April. Some of these constitutions were adopted by the provincial congresses, the rest by conventions called by the congresses. None of them were submitted to popular ratification: the adopting bodies themselves had no basis but popular desire and consent, and the people asked nothing better than to have them assume the power. But in the other New England colonies there was no such haste, for their bodies of law were satisfactory enough. Even the Massachusetts General Court did not replace the royal charter by a constitution till 28 Feb. 1778, and when it was submitted to popular vote it was rejected; another, drawn up by John Adams, was adopted by a convention 2 March 1780, and ratified. The two colonies already under pure democratic charters took no steps to alter them: no alteration was needed. In fact, Connecticut remained under the charter of 23 April 1662, which by statute of 1776 was enacted to be the Constitution of the State, until 1818, when a strong democratic movement took the reins of power from the hands of the local aristocracies which mainly exercised it; while Rhode Island remained under the charter of 14 March 1643, renewed 1663, until 1842, two thirds of a century after the Revolution, when the great disfranchised mass revolted against the former oligarchy (see DORR REBELLION), and forced it to include them.

Constitution, The, or **Old Ironsides** (from the slightness of the injury her hull received in the fight with the Guerrière), one of the most famous vessels of the American navy, now fixed in Boston harbor. She was a 44-gun frigate of 1,576 tons; one of the six war vessels ordered by Congress early in 1794, on account of the Algerian piracies (see BARBARY POWERS, U. S. WARS AND TREATIES WITH THE). These were

built not on contract, but by the day, under the eyes of practised commanders, and embodied the latest experience of all nations; and were the supreme types of their class on the globe. The Constitution was built at Boston by George Cloghorne and Mr. Hartley, at a cost of $302,710, and was launched 20 Sept. 1797. An English officer in 1815 said she was one of the finest frigates, if not the very finest, he ever set foot on. She took part in the war of 1800 with the French in the West Indies, as Commodore Talbot's flag-ship; her first lieutenant was Isaac Hull, by whose seamanship she beat an English frigate several miles in a day's race, and who in a boat from her captured a French privateer at Hayti. In 1803 she went to the Mediterranean as Preble's flag-ship, and took part in the operations against the pirates,—notably the recapture of the Philadelphia (see DECATUR, STEPHEN), and the bombardment of Tripoli August–September 1804. It was while sailing to relieve her that the Chesapeake (q.v.) was so bloodily raided by the Leopard. In 1811, when on an errand to England under Hull, then captain, two English frigates undertook to repeat the Leopard's performance with her; but Hull outsailed the one and closed with the other, daunting the latter into drawing off, to the great disappointment of the Constitution's crew.

When the War of 1812 broke out Hull started to join the New York squadron with her, 12 July; was cut off by a British squadron, including the Guerrière, but in a wonderful chase of three nights and two days outmanœuvred and escaped it. The Navy Department was exceedingly afraid of an encounter between British ships and its own, was barely shamed out of keeping the latter all in port to prevent their capture, and had instructed Hull not to risk an engagement with a superior force; it had resolved to supersede him by Bainbridge, and had sent him word to remain in Boston till further orders; but he had foreboded some mischief and, 2 August, to avoid receiving undesirable orders, slipped out of Boston with his ship. A high authority says that had his ship been captured or unsuccessful, he would have been hanged or shot for disobedience of orders. Sailing for the Bay of Fundy and the Gulf of St. Lawrence in hope of prizes, but disappointed, he stood south for Bermuda; but on the 19th, about 100 miles east of Boston came (without recognizing her) upon the Guerrière. Its captain, Dacres, had met Hull before and bet a hat with him as to the results of a mutual fight, and had left the squadron precisely in order to capture in single combat the vessel which had eluded the whole body. The Constitution had 55 guns firing 700 pounds of metal, the Guerrière 49 guns firing 597; the crews were respectively 468 and 263. The frequent statement that the Guerrière was a rotten and worn-out ship is, however, a fiction. After manœuvering for position, about 5.45 P.M. the Constitution steered straight for the enemy, but reserved her fire; the Guerrière kept up a hot fire, wounding several men; at 40 yards Hull let fly his whole broadside, with the accuracy of American naval gunnery and with fearful destruction. By 6.10 the Guerrière's main yard was shot away and the rigging, sails, and hull badly damaged; just then the mizzenmast was shot through and fell dragging in the sea, acting as a rudder and making the helm useless. The Constitution came about and raked her hampered foe with two terrible broadsides, and the two shortly met. Both wished to board, but the rolling prevented it; the rigging, however, was filled with sharpshooters who swept the decks, badly wounding several officers of both, including Dacres, and killing one of the Constitution's. At 6.22 the Guerrière's foremast came down and carried the mainmast with it, with all the yards and rigging; and the dismasted wreck rolled in the trough of the sea perfectly helpless. Hull took possession, refusing to accept Dacres' sword, but asking for the hat. The Guerrière had lost 15 killed and 63 wounded; the Constitution, seven killed and seven wounded. The Guerrière was sinking and could not be towed into port; she was therefore blown up. Hull sailed into Boston with his prisoners, to such an ovation as few men have ever earned in so short a time. In less than 25 minutes of actual fighting he had lifted the despised American navy and nation to an equality with the proudest of the world; and drew from Great Britain such an explosion of rage and humiliation as it has never known before or since.

Hull generously gave up the command, to give a chance to other officers, they being more plentiful than frigates; and the Constitution was made Bainbridge's flag-ship for a cruise against English commerce in the East Indies. On 29 Dec. 1812 it encountered the Java, Capt. Lambert, off the coast of Brazil, and at 2.10 P.M. joined action. The Constitution had 54 guns, with 787 pounds of metal; the Java 47, with 568 pounds. The crews were 480 and 426. One of the fiercest of naval battles ensued for nearly two hours, in which the Constitution's wheel was shot away at the outset, making its navigation difficult, and the English vessel was the better sailer anyway. But the American gunnery was incomparably more intelligent, and improved every opportunity for raking broadsides, while the British did not. As soon as the Constitution came to close quarters, she inflicted ruinous damage and frightful slaughter. The Java's jib-boom and bowsprit were soon shot away, and the running rigging made useless; at 3.05 P.M. the foremast was carried away, shattering the forecastle and main deck, and making several guns inaccessible; soon afterward the maintopmast fell, and in a short time the gaff and spanker boom. Bainbridge had been twice badly wounded, and now Lambert was fatally shot. At 3.30 the Java's fire slackened, and the Constitution poured in broadsides almost unanswered; at 3.55 the former's mizzenmast went; at 4.05 the fire had wholly ceased, half the guns were useless, and the mainmast was tottering and had to be cut away. This closed the action, and the Java struck. She had lost 60 killed and 101 wounded, against the Constitution's 9 killed and 25 wounded. The Java was so utter a ruin that she could only be got into the nearest port (Bahia), and was blown up. The Constitution was taken into Boston for repairs; but before they were completed, Boston was closely blockaded, and she did not escape till New Year's Day 1814, under Capt. Charles Stewart.

In a cruise to the West Indies, Capt. Stewart captured four prizes, with 24 guns and 76 men; one of them was the 14-gun schooner Picton. Again blockaded by a powerful British squad-

ron, she did not escape till 17 Dec. 1814. The news that the Constitution was loose again spread consternation among the British merchant service, and vigilance among the naval. Standing toward the Madeiras, on 20 Feb. 1815 Capt. Stewart, about 150 miles northeast of Madeira, encountered two ship-rigged war vessels: the frigate Cyane, 34 guns with 451 pounds to the broadside; and the sloop-of-war Levant, 21 guns with 303 pounds, aggregating 55 guns with 754 pounds. The Constitution had 51 guns with 644 pounds. The two, however, had but 313 crew against the Constitution's 456. The engagement began at 6.05 P.M. For skill and beauty the manœuvres by which Stewart rapidly passed back and forward around and between the ships, raking both with terrific broadsides again and again, and slipping away from them when they had secured raking positions, are unsurpassed in naval history. At 6.50 P.M. the Cyane struck; the Levant temporarily escaped, but was overhauled by the Constitution, and at 10 P.M. surrendered also. The two ships had lost 35 killed and 42 wounded; the Constitution, 4 killed and 10 wounded. Cut off by a powerful British squadron at a neutral port whose neutrality the English treated with utter contempt, the Constitution and Cyane succeeded by fine seamanship in escaping, but the Levant was recaptured. In 1830 she was reported unseaworthy, and condemned to be broken up, but Oliver Wendell Holmes published in the Boston *Advertiser* his thrilling poem 'Old Ironsides,' and the public clamor excited by it saved the noble vessel, which was rebuilt and again put in service in 1833. In 1855 she was laid up at the Portsmouth Navy Yard, but used sometimes as a training-ship; in 1877 was again partially rebuilt, and took her last trip across the Atlantic the next year. In 1897 she was roofed in at the Boston Navy Yard, and has since been used as a barrack ship, etc.

Consult: Hollis, 'The Frigate Constitution' (1900); Maclay, 'History of the United States Navy,' Vol. I. (2d ed. 1898); Henry Adams, 'History of the United States,' Vol. VI., VII., IX. (1900–1); Roosevelt, 'Naval War of 1812' (1882).

Constitutional Law. See LAW, CONSTITUTIONAL.

Constitutional Union Party, in United States history, popularly known in its own time as the Bell-Everett party, from the names of its presidential candidates; the name assumed by the remnant of the Southern Whigs in 1860. The Whig party (q.v.), as incongruous a body as ever acted together in politics, had cohered only by ignoring the slavery issue as long as possible. So soon as this became the controlling issue by reason of the Fugitive Slave Law of 1850, it split hopelessly into the Northern and Southern branches. The election of 1852, in which it carried but two Northern and two Border States, and less than one third of the national House, many of those bolting Southerners, was accepted by the whole country as marking its end; but it was not till the crowning blow of the Kansas-Nebraska Bill (q.v.) that the Northern section openly founded the Republican party. The Southern Whigs were divided; part of them joined the Democrats; the remainder would not join the Republicans in opposing slavery, nor vet the Southern Democrats in making it the one touchstone, much less in setting it above the Union. After attempting to draw a herring across the trail by the anti-foreign agitation (see AMERICAN PARTY), in 1860 they doubled back desperately to the old policy of excluding slavery from the platform; but this time appealing to the love of the Union as the bond of unity, and calling on all who loved it to refrain alike from attacking or upholding it, and simply to preserve the *status quo* of the compromise of 1850. But that compromise had in fact been repealed by its friends, not by its enemies; the Kansas-Nebraska Bill had made a clean slate. On 9 May 1860 this element held a convention at Baltimore; adopted a platform deprecating "geographical and sectional parties," and making it an obligation of both "patriotism and duty" to hold as a sole political principle "the Constitution of the country, the Union of the States, and the enforcement of the laws" (that is, the Fugitive Slave Law); and nominated for President John Bell of Kentucky, and for Vice-President Edward Everett of Massachusetts. The party had only a small scattering vote in the North, where the Republican party satisfied the opponents of slavery aggressions, and the sudden rise of that party into enormous proportions frightened the Conservatives into acting with the Democrats. But in the South it was the only refuge left for the Union men and moderates, who would not vote for Breckinridge and the secession Democrats; and it carried the three Border States (q.v.), Kentucky, Tennessee, and Virginia; almost carried Maryland, was but lightly defeated in Arkansas and Delaware; and also came well toward equality in North Carolina, in Florida, and in Louisiana. Indeed, it is surprising how light the majority for the Breckinridge ticket was in general through the South, except in Mississippi and Texas. The party gained 39 electoral votes, and 589,581 popular votes. The loyal element in the War was composed largely of this body of voters. It was represented by the West Virginians, who tore away their entire section from the Old Dominion, by the East Tennesseeans, who made it possible to retain that State, by the Kentucky "neutrals," and by others. But the leaders, so far as they retained political vitality, became Democrats on the Reconstruction issue.

Constitution of Matter. See GASES, KINETIC THEORY OF; MATTER; MOLECULAR THEORY.

Consubstantial, kŏn-sŭb-stăn'shal, having the same substance or essence co-essential. When the Arian controversy ran high in the Church, and with the view of settling it, Constantine was induced to summon the general council of Nice in 325, the council pronounced in favor of the Athanasian view that the Second Person of the Trinity is *homoousios* with the Father. To this the corresponding Latin term was consubstantialis. The Greek and Roman Catholic Churches, as well as those of England and Scotland, with the leading Continental Protestant Churches, still adopt this view; thus the second of the Thirty-nine Articles commences, "The Son, which is the Word of the Father, begotten from everlasting of the Father, the very and eternal God and *of one substance with the Father.*" Similarly the Westminster Confession of Faith — the standard

of the proper Presbyterian Churches — teaches that "In the unity of the Godhead there be three persons of one substance." (Ch. ii., § 3.)

Consubstan'tiation, the doctrine that in the Holy Eucharist the real body and blood of Christ are present and are of the same substance with the bread and wine. The doctrine of Transubstantiation is that when the words of consecration are pronounced by the priest, the bread and wine are substantially changed, into the body and blood of Christ, and consequently cease to exist as bread and wine. The doctrine of Consubstantiation, on the contrary, is that after consecration they continue to exist in their original form, but substantially conjoined with the body and blood of Christ.

This doctrine, generally ascribed to John of Paris, as its earliest advocate, has had few, if any, confessors. The term "Consubstantiation" is often incorrectly used to designate Luther's doctrine of the sacramental conjunction with the bread and wine, which is a very different thing from that of the substantial conjunction. Luther taught that the bread and wine are present in the natural, but the body and blood in a supernatural manner. The presence is not "consubstantial"; for while the elements are masticated, swallowed, digested, etc., the body of Christ, according to Luther's teaching, is present only when the element is received by the communicant, as the words of distribution are repeated, and no longer. The presence of the elements is comprehensible, visible, tangible; that of the body and blood incomprehensible, invisible, mysterious, and inexplicable. The belief that the body and blood of Christ can be received in the same way as the bread and wine, the Lutheran Church designates as "Capernaitic-error," as the people of Capernaum, in John vi. 52, seemed to have had such an impression. Consubstantiation is sometimes called Impanation.

Consuelo, kôn-sü-ā-lō, a novel by Amandine Lucile Aurore Dudevant (George Sand), published in 1842. This and its sequel, 'The Countess of Rudolstadt,' issued the following year, form a continuous romantic narrative, of which the first book is the more famous. While not the most characteristic novel, perhaps, of the great French authoress, 'Consuelo' is the best known to general readers. It abounds in picturesque and dramatic scenes and incidents, in glowing romance, in the poetry of music, and the musical life.

Consul, the title given to the two chief magistrates of the ancient Roman republic, and to the three supreme magistrates of the first French republic during the last five years of its existence. In present usage the term indicates an official who resides in a foreign seaport or other commercial centre as the representative of his home government, and who is charged with the protection of his fellow-countrymen and the safeguarding of their interests.

The office of consul was created in Rome about 508 B.C., after the expulsion of the kings. The election to the consulship was annual, and only patricians were eligible until the Licinian laws opened the office to the plebeians.

In the history of France the title of consul appears after the fall of the Directory, when three consuls were appointed. The constitution of 13 Dec. 1799 gave to the first of these magistrates the real power, the others having only an advisory voice in the government. Napoleon Bonaparte became first consul. In 1802 he was confirmed in the consulship for life, and in 1804 he abolished it by the establishment of the empire. The office of consul in the present signification of the term had its origin in the extensive trade relations of the Italian cities of the 12th century.

In 1780 the first United States consul was commissioned. The consular system was established by acts of Congress in 1790 and 1792. The consular posts of the United States are arranged by statute in three classes: (1) Those in which the incumbents receive a fixed salary and are not allowed to transact business; (2) those to which a fixed salary is attached, and business transactions permitted; (3) those in which the incumbents are compensated by fees collected in their offices, and are allowed to transact business. There were in existence, 25 Oct. 1902, 315 consular posts. Among the responsibilities developing upon United States consuls are the regulation of shipping, the issuing of passports, and of certificates of births, deaths, and marriages, the caring for disabled seamen, and the insuring of justice to native-born or naturalized American citizens. Consuls also send reports to the home government concerning foreign trade conditions. In countries where the government is unstable or despotic, American consuls are vested with exceptional powers. They may exercise judicial functions over lawbreakers of their own nationality, such as fining, committing to prison, etc. Special powers and duties of consuls are determined by treaty. Before entering upon his duties a consul must receive an exequatur from the government to which he is accredited. No radical change has been made in the consular service of the United States since its establishment. President Cleveland by executive order in 1895 applied civil service principles to consular posts of a certain class. Of late there has been considerable agitation in favor of reorganizing the system.

Bibliography.— Schuyler, 'American Diplomacy and the Furtherance of Commerce'; Straus, 'Reform in the Consular Service'; Warden, 'Origin, Nature, and Progress of Consular Establishments.'

Consular Service of the United States. The first consul of the United States was appointed 9 Dec. 1780, although the commissioners of the United States in Europe had exercised consular functions in addition to their diplomatic duties prior to that time. Five years afterward Congress declared by a joint resolution that it was expedient that the United States should appoint consuls abroad, and expressly authorized American ministers in Europe to exercise the powers of consuls general in the countries to which they were accredited. The Constitution, adopted in 1787, conferred upon the President the power to nominate, and by and with the advice and consent of the Senate, to appoint consuls. While President Washington in pursuance of the authority given him by the Constitution, appointed a number of consuls and vice consuls, no detailed law regarding consuls was passed until 14 April 1792. That law, which was to carry into effect our consular treaty with France, did not create or even regulate a consular system, but merely recognized its exist-

ence by imposing upon consuls certain specified duties. The act of 1 May 1810 appropriated salaries for the consuls at Algiers, Tangier, Tunis, and Tripoli, which for nearly 30 years were the only consular salaries provided by law. For the most part, the United States, like most other nations, started by appointing unpaid consuls from among American merchants residing abroad, or, if they were sent from America, by permitting them to enter into business as a means of insuring support. Consuls were also allowed to retain as compensation the fees collected for official services performed.

This so-called system was found to work badly for the interests of the government as well as the individual citizen, and as early as 1816, the secretary of state, to whose discretion the administration of the service was left, proposed to Congress to pay fixed salaries to the consuls at more important places, at least. Efforts in this direction were continued from time to time with the object of so providing for the compensation of consuls that they could devote their entire time to their official duties, but nothing was accomplished until 1856, when Congress passed the law in pursuance of which the reorganization of the consular service upon substantially its present basis was effected. The aim of this act was to reduce the service to a regular system somewhat in line with the British consular service by providing for fixed salaries for the principal consuls, prohibiting those consuls from engaging in business, and requiring them to remit to the secretary of the treasury all fees collected by them for performing official services. Since that time, many laws have been passed affecting the consular service, but the greater number of them have been directed to details and have not materially changed the system organized under the act of 1856. During recent years, various attempts have been made to reorganize the consular service by providing fixed salaries for all officers, requiring all fees to be turned into the treasury, and prescribing qualifications for admission to and promotion in the service. All these attempts have so far been unsuccessful. An important step in this direction, however, was taken by President Cleveland in 1895, when he issued an order which is still in effect, requiring the examination, by a board of three persons to be designated by the secretary of state, of applicants for appointment to places in the consular service the salaries of which are more than $1,000 and do not exceed $2,500 a year. The examination is not competitive. Applicants holding, or having held positions under the Department of State of a nature to qualify them for the performance of consular duties are not required to be examined.

Consular officers of the United States are divided into two classes, principal and subordinate. Principal officers are consuls general, consuls, and commercial agents. Subordinate officers are vice consuls general, deputy consuls general, vice consuls, deputy consuls, vice commercial agents, deputy commercial agents, consular agents, and consular clerks. There are also interpreters, marshals of consular courts, and office clerks. Consuls general perform the same duties as consuls, and in addition have general supervision over consuls within the limits of their jurisdiction. Like consuls they are appointed by the President and confirmed by the Senate. Commercial agents have, under the laws of the United States, the same powers and duties as consuls. The title of the office as representing a distinct grade in the consular service is peculiar to the service of the United States, and usage has established the appointment directly by the President, without confirmation by the Senate. It is usual to ask formal recognition and an exequatur for a commercial agent from the government to which he is accredited as in the case of consuls general and consuls. Vice consular officers fill the places and exercise the functions of consuls general, consuls, and commercial agents when those officers are temporarily absent or relieved from duty. They have no powers when the principal officers are present at their posts. Deputy consular officers are subordinate to, and exercise their powers and perform their duties under, the direction of principal officers. Unlike vice consular officers, they perform their functions when their principals are at their posts as well as when they are absent, but they are not authorized to assume responsible charge of the consular office. Consular agents are subordinate to principal consular officers, exercising their powers and performing their duties at ports or places different from those at which their principals are located. Their functions are not in all respects as extensive as those of principal officers, and they are not authorized to correspond with the Department of State. Vice and deputy consular officers and consular agents do not receive commissions, but are given certificates of appointment signed by the secretary of state. There are 13 consular clerks provided for by law. They are appointed by the President, after examination, and can only be removed for cause, stated in writing, which must be submitted to Congress. They are assigned from time to time to consulates with such duties as the secretary of state may direct. Consular officers qualify by taking a prescribed oath, and all except consular agents and consular clerks are required to file a bond to the United States for the faithful performance of their duties. The salaries of consuls general, consuls, and commercial agents range from $5,000 to $1,000 a year. Consuls receiving salaries of $1,000 a year are permitted to engage in business. There are also a number of unsalaried consuls and commercial agents who are permitted to retain as compensation not more than $2,500 a year from the official fees collected by them and to engage in business. Vice and deputy consular officers receive no fixed salaries. Consular agents receive as compensation one half of the official fees collected by them. Consular clerks receive salaries of $1,000 for the first five years' service, after which their salaries are $1,200 a year. All fees for unofficial and notarial work are retained as personal compensation by the officers collecting them. The statement given shows the number of consular officers on 30 November 1903.

The duties of consuls of the United States are varied, and include the shipment, discharge, and relief of seamen of American vessels, adjustment of differences between masters and crews; reclamation of deserters; protection of citizens of the United States; settlement of estates of citizens who may die intestate in foreign countries; issuance of bills of health certifying to the sanitary condition of the cargo,

passengers, and crew of vessels clearing from foreign ports for ports in the United States; issuing and viséing of passports; superintending the disinfection of merchandise exported to the United States from a district in which infectious diseases exist; execution of landing certificates; and certification of invoices of merchandise valued at more than $100 exported to the United States. The latter duty is highly important for the protection of the customs revenue, and makes it necessary for consular officers to examine carefully each invoice before certifying that the prices stated therein are correct. In case the merchandise is found to be undervalued, notice of the fact is sent to the collector of customs at the port in the United States to which the merchandise is destined.

	Salaried	Compensated by Fees	No Compensation	Total
Consuls General	48			48
Consuls	219	34		253
Commercial Agents	9	20		29
*Vice and Deputy Consuls General			30	30
Vice Consuls General			19	19
Deputy Consuls General			13	13
*Vice and Deputy Consuls			132	132
Vice Consuls			105	105
Deputy Consuls			25	25
*Vice and Deputy Commercial Agents			10	10
Vice Commercial Agents			12	12
Deputy Commercial Agents				
Consular Agents		385		385
Consular Clerks	13			13
Marshals	10			10
Interpreters	16			16
Total	315	439	346	1,100

*The two offices are usually combined, when practicable.

Consular officers are not permitted to solemnize marriages, but they may, when requested, be official witnesses of the ceremony of marriage where one of the parties is a citizen of the United States. In such cases they give each of the parties a certificate of the marriage, and forward a certificate thereof to the Department of State. Under section 4082 of the Revised Statutes marriages in the presence of a consular officer of the United States in a foreign country, between persons who would be authorized to marry if residing in the District of Columbia, are declared to be valid and to have the same effect as if solemnized in the United States, but the operation of this statute outside of the District of Columbia and the Territories is doubtful.

The exemptions and privileges of consular officers depend largely upon the treaties existing between the United States and the countries to which they are accredited. In the absence of treaties, consuls after receiving their exequaturs are regarded both as officers of the State which appoints and the State which receives them under the special protection of international law. They may claim inviolability of the official property and archives; exemption from military service and service on juries, and the right to place the arms of their government over their doors.

By virtue of treaties and Title XLVII. of the Revised Statutes, consular officers in China, Siam, Turkey, Morocco, Maskat, Persia, Zanzibar, and Tripoli, are invested with judicial powers. In China, Turkey, and Siam, consuls are empowered to arraign and try all citizens of the United States charged with offenses against law, committed in that country, and to sentence offenders. They also have jurisdiction in civil cases between American citizens. In the trial of cases between citizens of the United States and subjects of China or Siam, the consuls of the United States act in conjunction with the Chinese or Siamese officials. In case of disputes between Turkish subjects and citizens of the United States in Turkey, provision is made for the presence of the dragoman of an American consulate at the hearing. The treaties with Persia, Maskat, Morocco, Zanzibar, and Tripoli give consular officers jurisdiction over cases the parties to which are American citizens, and provide for the assistance of consuls in the trial by the foreign tribunal of cases in which one party is a citizen of the United States and the other a subject of the foreign power.

The duties of consular officers with respect to the development of our foreign trade are of comparatively recent origin, but, owing to increased competition among commercial nations, have become of special importance within the past few years. Every consular officer is now expected to have accurate knowledge of the conditions of trade and commerce of the place where he is located, and he is required to keep the Department of State fully informed regarding all matters of interest touching the industries, trade, commerce, and navigation of the country of his official residence. He must be alert and report promptly new markets for American products or manufactures, the construction of public works, changes in transportation rates and facilities, the opening up of new trade routes, changes in economic conditions within his district, improvements of old and development of new industries including inventions or discoveries, development, or decline of commercial and manufacturing centres, projects for great manufacturing or other industrial enterprises, river, and harbor improvements, hygienic, and quarantine measures, fluctuations in rates of wages, changes in tariff legislation, the enactment of patent, trade mark and copyright laws, and legislation preventing the adulteration of food, and all other information of value to the commercial and industrial interests of the United States. The information reported that may be of current interest is printed in a publication known as 'Advance Sheets of Consular Reports,' which has been issued daily since 1 Jan. 1898. The reports are collected at the end of every month and printed in a periodical monthly, 'Consular Reports,' established in 1880. More comprehensive reports are prepared annually under special instructions of the Department of State with the object of presenting a statement of the trade, not only of the United States with the rest of the world, but of the various countries with each other, and these reports are published under the title of 'Commercial Relations.' From time to time, at the suggestion of individuals or firms seeking information as to conditions in foreign countries, special reports are obtained from consuls and are printed in separate form.

The cost of the consular service for the fiscal year ending 30 June 1902, including salaries, allowances, and other expenses, was $1,194,447.53, while the fees collected by consular officers during the year and turned into the treasury amounted to $1,097,475.03, making the actual cost to the government of the entire service for the year, $96,972.50.

The volume known as 'Consular Regulations,' the latest edition of which was published in 1896, contains all the laws, treaties, and regulations which govern consular officers in the performance of their duties.

Bibliography.— Warden, 'Origin, Nature, Progress, and Influence of Consular Establishments' (Paris 1813); Schuyler, 'American Diplomacy' (1886); 'Regulations Prescribed for the Use of the Consular Service' (Washington 1896); House Report, No. 562, 56th Congress, 1st Session; Senate Report, No. 1202, 56th Congress, 1st Session; Senate Report, No. 154, 40th Congress, 2d Session; House Executive Document No. 120, 48th Congress, 2d Session; House Executive Document, No. 65, 48th Congress, 2d Session.

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Consumers' League, an organization intended "to promote better conditions among the workers" by encouraging the purchase of goods made and sold under proper conditions. The work of the organization is based upon the principle that the purchase of an article tends to create a demand for that article, and that in the stress of modern competition manufacturers and merchants are unable to improve the condition of their employees, while there is a constant demand for cheap goods, "regardless of how cheapness is brought about." The first consumers' league in the United States was organized in New York in 1898; its object was to investigate retail stores and to encourage the patronizing of those conforming to their standard of conditions. They have now a "white list" of over 40 stores in New York, where the league certifies that conditions of employment are satisfactory. The standard for a "fair house" demands: (1) Equal wages for women and men for equal work, wages to be paid by the week; (2) hours from 8 A.M. to 6 P.M., with three quarters of an hour for lunch, overtime to be paid for, and a half-holiday in the summer; (3) retiring and lunch rooms to be separated and regulated according to the sanitary laws; (4) recognition of fidelity and length of service and general considerate treatment; (5) no children under 14 to be employed.

The National Consumers' League was organized in 1898 for the purpose of regulating conditions of manufacture rather than sale. The national organization is a federation of State leagues; the governing body is a council consisting of representatives from the State leagues. The council annually elects a president, two vice-presidents, two secretaries, and a treasurer; and these, with two representatives from each State league, constitute the executive committee of the council. Any person living where there is no local or State league may join the national society by paying a yearly fee. The work of the league has so far been limited to one industry, the manufacture of women's and children's white underwear. The main lines of its work are: enlisting the aid and interest of authorities in the enforcing of labor laws and furthering of necessary legislation; investigating conditions of labor and awarding the use of the league's label to manufacturers conforming to their standard; educating public opinion by lectures, correspondence, and literature. The standard for establishments entitled to the label demands: (1) That all State factory laws be complied with; (2) that the label be used only on goods made on the premises; (3) that no children under 16 be employed; (4) that no person work over 60 hours a week. The national organization embraces 35 leagues in 13 States, and 38 establishments in 11 States are entitled to the use of the label.

Bibliography.— Brooks, 'The Consumers' League'; Brooks, 'Label of the Consumers' League' (in the American Economic Association's Publications, 3d series, Vol. I., 250–8); Kelley, 'Aims of the Consumers' League' (in the 'American Journal of Sociology,' Vol. V., 289); Lowell, 'Consumers' League'; McVey, 'Work and Problems of the Consumers' League' (in the 'American Journal of Sociology,' Vol. VI. 764); and the reports of the National Consumers' League.

Consumption, in political economy, all use or expenditure of the products of industry or of things having an exchangeable value; a term to a large degree interchangeable with "demand." It is usually characterized as productive or unproductive, according as it does or does not conduce to the efficiency of a producer and to further production. Thus wealth in the form of machinery is consumed productively by wear and tear in the possession of production; and, similarly, wealth expended in improving land is productively consumed; but the wealth expended in the maintenance of an operatic artiste is, from the ordinary point of view, unproductively consumed. The classification, however, is not of a very definite kind, the distinction lying for the most part in the degree of directness and obviousness with which the act of consumption is related to production. Hence, in the case of the operatic artiste, it is sometimes urged that the recreative benefit conferred upon the community tends indirectly to increase efficiency in production, and that from this point of view the artiste consumes productively. So the expenditure of wealth in war, or in preparations for war, usually classed as unproductive, may be really productive consumption, as tending to the assurance of the producer in the stability of the commercial conditions.

The perfect characterization of an act of consumption as productive or unproductive involves the consideration of elements of a frequently incommensurable kind, and the rough practical economic test has to be employed with some amount of reservation. Consumption is the end of all production; and as the demand of the consumer determines the employment of the various coefficients of production, land, labor, and capital, it is urged by many later economists that the scientific treatment of economics should proceed from consumption to production, instead of from production to consumption in accordance with the method of the older economics. Too much stress may be laid upon this method, but the consideration of economic problems from the standpoint of the consumer is of advantage,

as giving the social need rather than the producer's profit the prior claim upon the attention. The modern treatment of consumption, however, not only makes it the starting-point in a discussion of economy, but, especially with German authors, attempts to show the relation of the phenomena of consumption with those of production, exchange, and distribution. More particularly there has been a growing tendency to study the question in the concrete, examining the schedules of household expenses, notably those of the laboring classes. What is styled the "new" economy, the ultra-modern system of economic teaching as set forth by the Austrian school and by the American economists, Patten and Clark, is in great part due to the new prominence given to consumption in economic discussion.

Consumption (Lat. "using up," "destruction"), in medicine, or Phthisis (from Gr. *phthio*, to consume), a disease known by emaciation, debility, cough, hectic fever, and purulent expectoration. The causes which predispose to this disease are very numerous. The following are, however, the most general: hereditary disposition; certain diseases, such as syphilis, scrofula, the typhoid and scarlet fever, and measles; employments exposing particular artificers to dust, or to the fumes of metals or minerals under a confined and unwholesome air; conditions which lower the general nutrition of the body, such as mental depression, overwork or study without proper exercise, exhausting discharges from the bowel, excess in drinking, and in the case of women frequent miscarriage, too frequent confinements, or unduly prolonged suckling. To these must be added climatic influences. A cold, damp climate is provocative of the disease. Moisture of atmosphere and dampness of soil are specially conducive to its attack. A moist, warm atmosphere is also hurtful. Purity of atmosphere is also of the highest importance. It has been clearly shown that the prevalence of lung affections in large cities is directly associated with overcrowding and the diminution of air space and bad ventilation.

Consumption attacks in an infinite variety of ways. But its leading symptoms are cough, sooner or later with expectoration, breathlessness, and progressive emaciation. Such an association of symptoms demands careful investigation as to its cause. The disease has two main types, the acute form, rapid and brief in its course, and the chronic, or more slowly progressive form. To the former the phrase galloping consumption is often applied, to the latter the term decline is not inappropriate.

In the acute form the patient is suddenly attacked with chills, high fever, quickened pulse, and breathing, and much prostration. Symptoms definitely pointing to the lungs may at first be wanting; and the physician may be in doubt as to the true nature of the attack, typhoid fever often beginning in a similar way. Very careful examination may fail to reveal the mischief already begun in the lungs. But soon cough and spit occur, and signs of changes going on in the lungs are discovered. The attack may never lose its acute form, high fever continuing, cough and spit becoming harassing, loss of flesh and strength and increasing difficulty of breathing ending in death by exhaustion in a comparatively brief period. Or the acute attack may abate, improvement set in, and the case become a chronic one, indicated by a persistence of the cough and spit, difficulty or shortness of breath, and sometimes pain over some part of the chest. Sometimes an acute case begins with a hemorrhage.

The chronic type often begins with cough, dry and hacking, specially on lying down at night or in the morning. The breathing is easily flurried, and great languor, with indolence, dejection of spirits, and loss of appetite prevail. In this state the patient frequently continues a considerable length of time, during which he is, however, more readily affected than usual by slight colds; and upon one or other of these occasions the cough becomes more troublesome and severe, and it is at length attended with an expectoration. By degrees the matter which is expectorated becomes more viscid and opaque, being on many occasions streaked with blood. In some cases a more severe degree of hæmoptysis attends, and the patient spits up a considerable quantity of florid, frothy blood. The breathing at length becomes more difficult, and the emaciation and weakness go on increasing. With these there may be pain in some part of the thorax, which, however, is usually felt at first under the sternum, particularly on coughing.

When the disease has advanced considerably its marked symptoms are the persistent cough, with copious expectoration, yellow, and sometimes streaked with blood, severe night sweats, great emaciation, hectic fever, a clubbed appearance of the finger ends, loss of color, the more marked from the bright hectic flush on the cheek, rapid breathing, and pulse. The characters of hectic fever are of the remittent type, that is, the fever at some time of the day rises till it attains a height, then it gradually falls. In consumption the rise begins after noon, and increases till evening, about 8 P.M., when it may reach 104° or thereby. It then gradually falls till 4 or 5 A.M. It is when it is about at its height that the bright pink flush appears on the cheek, contrasting with the general paleness of the skin.

In the last stage of the disease the emaciation is so great that the patient has the appearance of a skeleton; and severe diarrhœa is common. To the end of the disease the senses and intelligence may remain unimpaired. Persons laboring under its most advanced stage often flatter themselves with the thought of a speedy recovery, and form distant projects under that vain hope.

The changes that occur in the lungs are, first, a consolidation, and then a breaking down. The consolidation is due to the formation of tubercles, small gray nodules, consisting of masses of round cells. The irritation caused by the tubercles results in the deposit of inflammatory material, and thus the part of the lung attacked loses its spongy cellular texture, and becomes firm and solid. Later the tubercles soften and break down into matter, carrying with them in their destructive change the substance of the lung in which they have become incorporated. This forms the matter of the expectoration, and with the breaking down and expulsion of the matter cavities or vomicæ are left in the lung. It is surprising how much destruction may thus be wrought in both lungs and yet life be maintained. The upper parts or apices of

the lungs, specially the left, are most frequently the parts attacked.

Consumption, Prevention of. The sole direct cause of tuberculosis of the lungs, commonly called consumption, is the entrance and growth in the lung substance of a particular vegetable micro-organism which is found among the disease-producing bacteria and is named the bacillus tuberculosis. This germ may enter the system in three ways:

1. By inhalation; that is, being breathed into the lungs. This is by far the most frequent way.

2. By ingestion; that is, eaten in tuberculous food, especially milk and beef, or in contaminated articles of diet.

3. By inoculation; that is, through scratches and wounds in the skin.

The indirect causes of consumption are very numerous, for anything that interferes with the normal development or normal vigor of the body renders it more susceptible to the disease.

To prevent consumption it is necessary (*a*) to establish and maintain the body in such health that it will be invulnerable to attack by the bacillus tuberculosis; or (*b*) to hinder the entrance of the germ.

Rarely are infants born with consumption. Many children, however, have an inherited predisposition; but if brought up under favorable circumstances and with proper oversight they may entirely escape the disease. In the young any pathological condition of the air-passages that impedes free breathing, such as adenoids or enlarged tonsils, should be remedied, and every obstruction to natural, healthy growth should be removed.

Any influence that lowers the vitality is a predisposing cause: for example, the acute infectious diseases, especially measles, whooping-cough and epidemic influenza; and diseases of the respiratory system, such as pleurisy, pneumonia, and bronchitis. Exhausting maladies, typhoid fever and the like, are ofttimes followed by tuberculosis of the lungs. Hence, after any of these, full restoration to health should be sought. Likewise in chronic inflammations of the heart, liver, or kidneys and in similar debilitating diseases, consumption frequently supervenes, and in all such disorders endeavor should be made to preserve the general health.

Those who live in wet and ill-drained districts, or in unsanitary surroundings, breathe an impure atmosphere, neglect personal cleanliness, have insufficient food or food of poor quality and badly cooked, suffer from exposure or indulge in excesses, are prone to acquire consumption. So also are those who work in ill-kept and imperfectly ventilated factories, shops, and stores, or whose work is injurious, in a dusty atmosphere, as in coal-mining; amid irritating vapors, as in match-making; in hurtful attitudes, as in shoe-cobbling; or at work that puts special stress upon the lungs, as in glass-blowing. Therefore all measures that better the hygienic state of the people and improve their mode of living are aids in preventing consumption.

Residence in an invigorating climate and in a wholesome environment; plenty of fresh air, indoors and outdoors, both day and night, with a maximum of sunshine; an abundance of nutritious food, and a well-ordered, temperate life, will do much to upbuild the human organism and fortify it against the invasion of the bacillus tuberculosis.

The bacillus is easily demonstrated under the microscope. Examined at different stages of their life history, these bacilli are found to exist in two forms: In the first, or active state, they appear as rod-shaped bodies; these rods increase in size and reproduce themselves, their multiplication being remarkably profuse under advantageous conditions. In the second, if unfavorably situated, they tend to dry up and form small rounded bodies called spores. Bacilli themselves are killed by comparatively simple means, whereas spores are much more tenacious of life.

From the lungs of a consumptive bacilli and spores may be cast off in very large numbers, amounting in some cases to 2,000,000,000 or 3,000,000,000 in 24 hours. The vast majority of such germs perish,—most quickly if exposed to sunshine; but it is possible for some immediately to enter the bodies of men or animals and produce centres of disease; or spores may float about for days and even for weeks in the dust of streets or rooms, ready to blossom forth in a congenial "soil" such as animal tissues.

The spread of consumption is almost exclusively due to communication of the disease from person to person through inhalation of the tubercle bacilli, and the problem of prevention is mainly that of destroying the bacilli wherever they are present, and of limiting their numbers in the air. For this reason a person who is consumptive should observe a few reasonable measures of precaution, both for his own sake and for the sake of others. If his occupation is such that he handles foodstuffs, or if he handles certain articles of use and wear, as a cigar-maker or clothing-maker, he should change his work. He should exercise great care as to cleanliness. His body- and bed-clothing, and particularly his handkerchiefs, should be washed apart and purified by boiling. He should use separate dishes and table furnishings. He should have his own bed, and preferably his own room. Rugs, not carpets, should be on the floor, and dust should be taken up with a moist mop. Above all else he should not expectorate carelessly. In the house he may use a mug or spittoon containing a little water, and at other times a pocket spittoon. In any event all expectorated matter should be boiled or burned, and the vessel carefully disinfected. Provision should be made not only for a cough accompanied by expectoration, but also for the so-called dry cough, and a handkerchief, paper napkin, or moistened cloth should be held before the face, else particles of germ-laden moisture will be sprayed on clothing, bedding, or floor. "The consumptive is himself almost harmless, and only becomes harmful through bad habits."

It is also important to avoid infected or contaminated food and drink. Tuberculosis attacks some animals, chiefly bovines. The milk from tuberculous cows, especially those with diseased udders, should not be used. Beef from infected cattle is undesirable, although cooking may render such meat innocuous. In some states dairy herds are regularly inspected,

and to suspected animals a test is administered. Those found diseased are killed, and the owner is compensated. This should be the universal practice. Finally, since consumption is most prevalent in centres of population, the rule should be adopted in cities and towns that all cases be reported by physicians to the health department, and all sufferers be instructed in methods that prevent spread of the disease.

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Con'tact, in astronomy, a word used in describing eclipses of the sun and moon, and also the transits of the inferior planets. In a solar eclipse contact takes place at the instant when the limbs of the sun and moon just touch each other either exteriorly or interiorly; in a lunar eclipse, when the shadow of the earth just touches the limb of the moon; and in the case of a transit of Venus or Mercury, when the limb of the planet just touches the sun's limb either exteriorly or interiorly. The instant of interior contact and of exterior contact are distinguished by these names.

Con'tact Action. A mixture of hydrogen and oxygen gases can be kept for any length of time without change, but if a piece of spongy platinum be introduced into the mixture in a very short time the gases combine with explosion. The platinum, which is found unchanged, is said to have acted by its presence or by contact, and the cause was ascribed to a peculiar force called by Berzelius "catalytic," the whole phenomenon being denoted by the term catalysis. There are many other examples of bodies inducing combination or decomposition without themselves apparently altering, but extended study of the whole subject renders it probable that in some cases the neutrality is only in appearance, the catalytic body really undergoing successive combination and decomposition, while in others, as in that given above, a modification of the physical circumstances is produced sufficient to determine the chemical change. There is no necessity, therefore, for assuming the existence of a peculiar force, though in individual instances it may not be at once obvious to what cause the effect is to be ascribed.

Contagion (Latin, *contagio*, from *contingo*, to meet or touch). The word Contagion in its strictest and narrowest sense, imports the communication of disease through the medium of touch, as in ringworm or syphilis. It is also applied to the action of those very minute particles which proceed from persons laboring under certain diseases, and which communicate these diseases without contact. Such minute particles are now usually regarded as distinct organisms or germs, probably of the nature of plants. The diseases so familiar in malarial districts, intermittent and remittent fevers, have been generally regarded as similarly communicated (but see MALARIA). The contagious virus of the plague, smallpox, measles, scarlet fever, and certain other diseases operates to a much more limited distance through the medium of the atmosphere than the miasmata of malarious districts. Breathing the air immediately surrounding a diseased person is said to be necessary for the communication of plague; and approach within two or three yards of him for that of typhus. The Walcheren miasmata are said to have extended their influence to vessels riding at anchor fully a quarter of a mile from shore. When disease is communicated through the atmosphere, infection is the most proper word to employ, though the terms infection and contagion are not employed with any great precision.

The character and nature of all these poisonous effluvia are little understood. They undoubtedly consist, however, in every individual case, of a specific virus; in some cases this is demonstrated to be a minute organism, and, most probably, there is always an organism which is capable of propagating itself where it finds a proper nidus. (See GERM THEORY.) Antiseptics are substances which arrest the growth of the germs of the disease. A good example of an antiseptic is carbolic acid in weak solutions. The purpose of a disinfectant is to destroy the matter of contagion. The disinfectants commonly used are carbolic acid, chloride of lime, Condy's fluid (a solution in water of permanganate of potash), sulphurous acid, obtained from burning sulphur, Burnet's fluid (a solution of chloride of zinc), sulphate of copper (blue vitriol) dissolved in water, and sulphate of iron (copperas), sulphuric acid (oil of vitriol), and hydrochloric acid (spirit of salt).

The diseases arising from miasmata are of a different class from those arising otherwise, since they are not communicated by one person to another. The disease communicated by diseased persons is usually so communicated by the product of the disease itself; for instance, by the matter of the smallpox; and therefore many of these diseases are infectious (or contagious) only when they have already produced such matter, but not in their earlier periods. In some of them actual contact with the diseased person is necessary for infection, as is the case with the itch, syphilis, hydrophobia, ringworm, etc.; in other diseases even the air seems to convey the infection, as in scarlet fever, measles, etc. The infectious matter of smallpox and scarlet fever may remain attached to clothing for a long time.

A real infection requires always a certain susceptibility of the healthy individual; and many infectious maladies destroy forever this susceptibility of the same contagion in the individual, and accordingly, attack a person only once, as the smallpox, measles, etc. Other contagious diseases do not produce this effect, and may therefore repeatedly attack the same person, as typhus, itch, syphilis, and others. Sometimes one contagious disease destroys the susceptibility for another, as the cowpox for the smallpox. In general, those parts of the body which are covered with the most delicate skin are most susceptible of contagion; and still more so are wounded parts deprived of the epidermis. Against those contagious diseases which are infectious through the medium of the air, precautions may be taken by keeping at the greatest possible distance from the sick, by cleanliness and fearlessness; but most completely by the vigilance of the health officers, by fumigations, according to the prescriptions of Guyton-Morveau, etc. Greater security against such contagious diseases as are infectious only in case of contact, can be obtained by means of cleanliness and caution in the use of tobacco pipes, wind-instruments, beds, clothing, and vessels for eating and drinking. No general preservative against contagious diseases is known,

though many are offered for sale by quacks. The examination of the persons intended for nurses and tenders of infants is very necessary, as thousands of children may be infected by contact with them, and the cause of the disorder remain unknown. See EPIDEMIC; MALARIA; etc.

Contarini, kŏn-tä-rē′nē, the name of a noble family of Venice. The most important members were DOMENICO, dō-mā′nē-kō, doge of Venice from 1043 to 1071 or 1073. He rebuilt Grado, and reduced the city of Zara, which had revolted. JACOPO, yä′kō-pō, doge from 1075 to 1080. Under his reign the Venetians forced the city of Ancona to acknowledge their sovereignty over the Adriatic Sea. ANDREA, än-drā′ä, doge from 1367 to 1382. The Genoese, under Pietro Doria, had conquered Chiozza in 1379, and threatened even Venice. Andrea Contarini reconquered Chiozza, captured the Genoese fleet, and delivered the republic from its enemies (1380). FRANCESCO, frän-chĕs′kō, doge from 1623 to 1625. Under him Venice, in alliance with Louis XIII. of France, the Duke of Savoy, and the Protestant cantons of Switzerland, reconquered the Pays de Vaud in 1624, which the Austrians had taken possession of. CARLO, doge from 1655 to 1656. Under his reign Lazaro Mocenigo, admiral of the republic, in June 1655, gained a brilliant victory over the Turks in the Dardanelles. DOMENICO, doge from 1659 to 1674. During his government Venice resisted for five years the attacks of the Turks on the island of Candia; but on 26 Sept. 1667, after a siege and defense of unexampled obstinacy, Francesco Morosini surrendered the island. AMBROGIO, äm-brō′jō, from 1473 to 1477, was ambassador of the republic at the court of the king of Persia, Usun Kassan. The interesting description of his residence at this court first appeared at Venice in 1487, in Italian. GASPARO, negotiated a permanent peace between the republic and Charles V. in 1529. Pope Paul III. conferred on him the cardinal's hat in 1535. In 1541 he was papal legate at the Diet of Ratisbon, where he distinguished himself by his moderation. After his return he was sent as legate to Bologna, where he died in 1542. GIOVANNI, jō-vän′nē: b. Venice 1549; d. 1605; was one of the most distinguished painters of his age. He worked in the style of Titian, and was particularly skilful in painting ceilings; for example, his 'Resurrection' in the church of St. Francesco di Paolo, in Venice. VINCENZO, vēn-chĕn′zō: b. Venice 1577; d. 1617; a scholar whose reputation was in early life so great that the magistrates of Padua established a new chair of Latin and Greek eloquence only to retain the learned youth of 26 years of age in their city. He lectured there until 1614.

Conte, Nicolas Jacques, nĭk-ō-lä zhäk kôńt, French inventor: b. Saint Cenery, near Seez, 4 Aug. 1755; d. Paris 6 Dec. 1805. After several successful experiments in the use of the balloon for military purposes he was made director of the French aërostatic institute, and chief of the aërostatic corps of the army. He also invented a substance for the manufacture of lead pencils, now universally used. He accompanied the French army at the time of Napoleon's expedition to Egypt, and erected works in Cairo for the manufacture of arms, ammunition, and other necessaries for the army.

Contemporane'ity. Formerly strata found partly with identical, partly with allied fossils, were held to be exactly contemporary, though widely separated on the earth's surface; now the same facts are used to establish the contrary conclusion. If each species came into existence at a certain spot on the earth's surface, from which it gradually spread in various directions, it cannot have reached a remote region till some considerable time after its birth. Two strata, then, widely separated in the world, containing some species common to both, are contemporaneous in this sense, that they were formed while that species lived; but the stratum near its birthplace is older than the one to which it spread after it had already multiplied greatly and rooted itself successively in all the intervening regions, wherever a place appropriate for its habitation could be found.

Contempt, a wilful disregard or disobedience of a public authority. The Constitution of the United States provides that each House of Congress may determine the rules of its proceedings, punish its members for disorderly behavior, and, with the concurrence of two thirds expel a member. The same provision is substantially contained in the constitutions of the several States. The power of making rules carries with it that of enforcing them, and the power to attach persons who violate them, and to punish them for contempts. Courts of justice have an inherent power to punish all persons for contempt of their rules and orders, for disobedience of their process, and for disturbing them in their proceedings.

Content' and **Non'content,** words by which assent and dissent are expressed in the British House of Lords. Aye and No are used in the House of Commons, Aye and Nay generally in American deliberative bodies.

Conti, kôń-tē, the name of a distinguished French family, a branch of the Bourbon house of Condé, deriving its title from the small town of Conti near Amiens, in Department Somme. It sprang from Armand de Bourbon, Prince of Conti, brother of the great Condé (b. 1629; d. 1666). He took an active part in the troubles of the Fronde both for and against the court, and married the niece of Mazarin. His son, François Louis (b. 1664; d. 1709) was brought up under the eyes of the great Condé, served with distinction under the Duke of Luxembourg, and was elected king of Poland by a number of the magnates, but declined the honor. The last of the house of Conti was Louis François Joseph, b. 1734; d. 1814.

Conti, Antonio Schinella, än-tō′nē-ō skē nĕl′lä kōn′tē, Italian mathematician: b. Padua 1677; d. there 1749. He gave up the clerical profession, because he disliked to hear confessions. He visited Paris, and in 1715 London, where he was elected a member of the Royal Society on the proposal of Newton. Here he became involved in the controversy between Newton and Leibnitz, and by attempting to avoid displeasing either of them dissatisfied both. He lived mostly in Venice, entirely devoted to his literary occupations, which included poetry.

Con'tinent. A definition of continent based on the origin and development of land masses is not possible in the present state of our know-

ledge, and about all that can be done is to define a continent as a very large body of land. North America, South America, Europe, Asia, and Australia are such land areas, but since Europe and Asia form a single land mass, many physical geographers speak of the two as one continent — Eurasia. There is also probably a land area of continental size in the Antarctic regions.

Origin of Continents.—The solid earth, the lithosphere, is largely covered by water, the hydrosphere; the proportion of land to water on the surface of the globe being about 1 to 2.63, making the land surface about 27.5 per cent of the total. The extreme height of the land above sea-level is about five miles (Mt. Everest 29,000 feet), and the extreme depth of the ocean somewhat more; the extreme relief of the lithosphere is therefore over 10 miles. According to Lapparent the mean elevation of the continents is as follows: Europe 958 feet; Australia 1,118 feet; South America 1,702 feet; North America 1,953 feet; Africa 2,007 feet; Asia 2,883 feet. The mean height of all land is estimated at a little over 2,000 feet, and the mean depth of the ocean at 12,000 to 15,000 feet. Therefore if the solid earth, the lithosphere, were free from inequalities, the hydrosphere would cover it, perhaps to a depth of over two miles. Inequalities of surface have, however, existed since the earliest geological time of which we have knowledge. The oldest rock formations show traces of sedimentary origin, and therefore represent in part the waste of land areas from the action of streams and the waves of the ocean. So far as North America is concerned the position of the continent had been determined in Archæan time. What determined the position of this and other continents is, however, still an unsolved problem, though there are several theories, each with some show of reasonableness.

The generally accepted theory is that when the crust of the molten earth had solidified and cooled enough to allow the condensation of aqueous vapor, it cooled and contracted unequally, some parts cooling and contracting toward the centre more rapidly than others. Thus were formed areas of depression and elevation, the seas filling the former, and the higher parts of the latter projecting above the water as land. The water would hasten cooling under the depressions, and thus the general tendency would be to increase the area and elevation of the land and increase the depth, but decrease the area of the sea.

Distribution and Form of Continents.—The distribution and form of continents show some curious features, and on these features theories of the origin of continents have been based. North and South America, for instance, are roughly triangular in shape, with the apex of the triangle at the south. Eurasia and Africa together form another roughly triangular land area tapering to the south, the Cape of Good Hope being the apex of the triangle. Owing to the lands tapering to the south, the northern hemisphere contains more land than the southern, and it is possible to divide the globe, by taking a north pole in the English channel, into two hemispheres, one nearly all land, and the other nearly all water.

Continents consist typically of a great interior basin bordered by mountain ranges, this form being shown by the continents of somewhat regular outline, the irregular Eurasian continent being an exception. In each continent the greatest mountain system faces the greatest ocean. In North and South America these mountains are on the west, facing the Pacific, with the smaller Appalachian Mountains, the Venezuelan Mountains, and Brazilian highlands facing the Atlantic. In Africa the greatest range is on the east, facing the Indian Ocean, in Australia the greatest range faces the Pacific, and in Asia the Himalayas face the Indian Ocean. Omitting the mountains of Eurasia, the mountain chains of the world have a northwest-southeast or northeast-southwest direction, and on this account the continents taper toward the south.

From the base of the mountains to the sea is a gentle slope or plain, and this plain extends frequently some distance beyond the shore, forming a continental platform or shelf. The outer edge of this platform is usually at a depth of about 100 fathoms (600 feet) when the bottom slopes rather sharply — forming the continental slope — to the depths of the ocean. Off the coast of New Jersey the 100-fathom line is 110 miles from shore, while on the coast of California it is only about 10 miles from shore. Great Britain stands on such a shelf and is really part of the continent of Europe. In the same way the East India islands to Celebes are part of Asia. New Zealand may be considered part of Australia.

Permanency of Continents.— It is one of the commonplaces of geology that the lands are continually changing; by weathering, by rivers, and by the waves of the ocean the rocks are worn away and spread out as sediments on the sea floor. In some parts of the world the land is apparently rising, in others sinking. The northern coast of Norway is rising five feet in 100 years, the coast of New Jersey and parts of the New England coast are sinking. At Boston the rate is about one foot in 100 years, and on the New Jersey coast two feet. Yet geologists, while admitting the instability of the lands, differ as to the permanency of continents. Lyell believed that neither continents nor oceans — so far as any particular part of the earth is concerned — are permanent. His views have been opposed by later geologists, who have thought that while continents may change form, certain parts of the earth have always been covered by oceans, while others have not; the Atlantic and Pacific, for instance, were always oceans, while the continents, even if at times partly covered with water, have always been uplifts in the sea floor.

Two objections to this view may be cited. In the first place, chalk beds, which are believed to be deep-sea deposits corresponding to the globigerine ooze that covers much of the ocean floor, are found in the interior of continents; in the second place, the study of fossils has shown that at times in past ages continents now separated by oceans had essentially the same fauna and flora. The evidence of deep-sea deposits shows that in Cretaceous time a deep sea covered much of Mexico and parts of Texas, New Mexico, Arkansas, and Kansas, while another, or perhaps the same wide, deep sea covered southern Europe and northern Africa and extended across Asia to the Pacific. In Cretaceous time, therefore, the continental land masses did not have their present form

and arrangement, and theories as to the origin of continents based upon present land forms are at best of doubtful value. The evidence of fossils indicates that in Permian time the Antarctic land mass was of far greater extent than now, and joined South Africa, Patagonia, and Australia. Again in Cretaceous time the evidence indicates that Brazil, south central Africa, Madagascar, and India were connected by land masses, so that the Atlantic and Indian oceans had not at all their present shape. There is some reason for believing that no longer ago than the beginning of the Glacial Period the Arctic lands were of far greater extent than now, Asia, North America, and Europe being connected. Thus, while it is fair to assume that the position of the continents was determined ages ago, there is nothing permanent about their forms or the present distribution of land and water on the earth.

Bibliography.— Mill, 'International Geography' (New York 1900); Suess, 'Das Antlitz der Erde' (Leipsic 1885); Dana 'Manual of Geology' (New York 1895); Penck, 'Morphologie der Erdoberfläche' (Leipsic 1894).

See also GEOGRAPHY; GEOLOGY.

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Continental Congress. See CONGRESS, CONTINENTAL.

Continental Money. The colonies at the time of the Revolution believed undoubtingly in paper money as real wealth. The foremost native leaders, like Franklin, declared that since money has value only from opinion, an opinion that paper is good has the same effect as one that gold is good; and later a member of the Continental Congress asked why the people should be taxed, when a cartload of money could be got at the printing-office. Few deeds of the British government excited more indignation than its prohibition of colonial paper issues in 1763; and when it was repealed in 1773 full advantage was taken of it. The colonies issued notes for military and other expenses of the coming conflict; and when the Revolution broke out, the New York Provincial Congress advised the Continental Congress to do likewise. That body was not only like-minded, but had no other means of raising money, lacking power to tax. On 23 June 1775 it issued bills for $2,000,000, on 17 July for $1,000,000, and on 29 November for $3,000,000. During 1776 it issued $19,000,000 more. The "opinion" that the redeemability of these bills was dubious had begun to show itself almost at once; and by the middle of 1776 the premium on specie was fully 135. This varied in different spots, according to patriotic feeling, and at different times, according to the fortunes of the cause; but even in Massachusetts it was strongly felt. As always, the depreciation was at first denied, and the rise in prices and reluctance to take the paper ascribed all through to everything but over-issue and bad security — mainly to speculation and want of patriotism. The usual laws were passed to force it on all who had goods to give in exchange, objectors being proclaimed "enemies of their country," which meant always plunder and frequently tar and feathers. Raising prices from a previous basis, or demanding payment in kind instead of money, constituted enmity to the country. Washington was given power by Congress to arrest all who "maligned the public credit"; local magistrates and local mobs took in hand all who refused to yield up goods for money which would buy much less goods; and at the beginning of 1777 Congress seconded their efforts with legislation. It resolved that the bills ought to be equal to Spanish dollars; that whoever asked, offered, or received more for goods in them than in any other kind of money, ought to be deemed an enemy and forefeit the goods; that the States were recommended to pass laws to that effect, and make the bills legal tender, extinguishing the debt if refused; and that debts payable in sterling money should be discharged in continental bills at 4s, 6d. to the dollar. The States were not loath to comply. Price conventions were held in some of them in 1777–8, which regulated the price of goods and labor, with severe penalties for violation, ordinances against forestallers and engrossers (that is, all who had goods and would not give them up for paper), etc. All these measures had the inevitable effect of increasing scarcity by making it not worth while for merchants to lay in stocks, and increasing depreciation by making prices include insurance for plunder, violence, and further depreciation.

In the middle of 1777 Congress tried the more sensible plan of stopping the issue of bills and trying to float a loan at interest; but it was unsuccessful and the notes were resumed. By the middle of 1778 the total had risen to over $60,000,000, and the depreciation was demoralizing the military service: the soldiers' pay was next to nothing, enlistments were almost impossible to get, and many of the officers resigned their commissions. The actual depreciation had become fully eight to one (though Congress in March established it at only 1¼), and was entirely impossible to calculate from week to week. In that year $63,000,000 was issued, making a gross total of $101,000,000, probably $90,000,000 out. Some of it was constantly coming back into the hands of government as payment of its requisitions on the colonies, and a little of it had been redeemed in interest-bearing loan certificates, but these acted as a preferred currency, and still further pulled down the continental bills, as did the excessive issues of State paper. By this time the British justly concluded that our "rag money" was doing us more harm than their armies could, and bent their efforts to increasing the quantity of it. They counterfeited it in large quantities and put it into circulation, aided by natives in the same profession. Congress felt compelled to withdraw two entire issues, but found it not easy to do; and in 1779 it launched on a wild and desperate debauch of the bills, which finally cured the evil by annihilating their value and forcing us to crawl out through the bottom. In January it issued $50,000,000 at a stroke, "on the faith of the United States," redeemable in 1797 — an 18 years' loan without interest, on what then appeared to be phantom security. By June it had issued $35,000,000 more, making $186,000,000, of which it was estimated that $160,000,000 was actually in circulation. The value had now sunk to an acknowledged five cents on the dollar, but, as the real depreciation was always grossly underestimated and postdated, probably not more than half of that in practice. Legitimate trade was mostly ruined, and honest merchants

driven out of business; hardly any one could make money in this welter of speculative values incessantly dropping, except men of alert perceptions and accommodating consciences. But the worse the situation grew, the more fiercely the people and their representatives, except a few superior intellects, refused to be disillusioned, and the more passionately they assailed the imaginary authors of their evils. On 1 Sept. 1779, however, Congress resolved that it would not have over $200,000,000 in circulation, and would not emit the lacking $40,000,000 if it could be avoided. But in a public address they say, with a curious anticipation of modern speech, that paper money is the best and safest kind, because it is the only one that stays with us, and is "always ready and at hand." This was true: it was in no danger of leaving the country. By the end of 1779 it had dropped down to an acknowledged two and a half cents and about a cent in reality, on the dollar. It had in fact reached the spot where any one would give whatever he had of it for any material goods he wished; there was no real and stable value, not even a very small one.

On 18 March 1780 Congress passed an act which was in effect notice that the old bills could never be paid. It was a favorite colonial scheme, when paper money had fallen to a hopeless pit of depreciation, to issue bills of "new tenor" without withdrawing the old. Under the new plan, the bills which were received from the States on the requisitions for $15,000,000 a month were not to be reissued, but replaced by "new tenor" bills for one twentieth the amount, drawing 5 per cent interest, and redeemable in six years; struck for each State in proportion to its monthly quota, and payable by it, but indorsed by the United States; six tenths of the issue to be given to the State treasuries and the remainder held by Congress; the States to provide sinking funds to redeem them at the end of the term. As to the old bills, they would be received at 40 for 1, in liquidation of commissaries' certificates; but the States were advised to repeal the laws forcing bills on any one at a fixed scale. On 26 May it was resolved that these certificates should be received at face value in payment of continental taxes, which was by so much a further inflation. The new-tenor scheme was a partial failure in volume, and still more in quality. Massachusetts, New Hampshire, and Rhode Island took up all their old tenor bills and replaced them by new tenor; New York, New Jersey, Maryland, and Virginia took up part; the rest none. In all, $88,000,000 of old were replaced by $4,400,000 of new; but probably over $100,000,000 remained out. Within a few months, however, the new-tenor had sunk to four for one; and of course the old bills, thus abandoned, became nothing but a speculative hope worth investing a few dollars for a great mass of, as a "flyer"—they had not been formally abandoned, and might yet be paid at a scale. Also, until specie was obtained, even bad currency was something to use. In July 1780 they were officially estimated at 64½ to one, which meant about 200 to 1 in fact. On 16 March 1781 Congress gave up all attempts at issuing paper of any tenor, having put out altogether slightly over $242,000,000. (The figures of $350,000,000 and upward count in reissues.) It made all debts payable only at current exchange between specie and paper currency, and again recommended the States to amend their tender laws likewise. This was the end of paper currency in that period. The French loans had furnished a moderate stock of gold and silver, and business necessities no longer demanded it. On 1 May the Pennsylvania Council officially rated it at 175 to 1; which the public translated as 500, and gave up the notes as old paper. There was a public celebration of the obsequies in Philadelphia: a barber-shop was papered with it; a dog was tarred, stuck over with the notes, and led through the streets; and men wore cockades of the money in their hats. In Rhode Island there was a mock burial of it. The poor men loaded with it, and those who had invested their savings in it, did not share in the rejoicing. For some reason also, it circulated some months longer in the South than the North, though on 1 August it was rating at 500 to 1 in Virginia. The soldiers in the camps had clubbed together and refused to accept it. The State paper currencies went down in the same way, though not quite so hopelessly: in Virginia the Continental money in 1778 was worth 2,400 to 1 as a chance, while Virginia paper was 40 to 1. The entire amount of still outstanding Continental bills was about $78,000,000 in 1791; in 1843 the amount never redeemed was stated at $73,000,000.

Consult Sumner, 'History of American Currency' (1874); 'The Financier and the Finances of the American Revolution,' Vol. I. (1891; Hildreth, 'History of the United States,' Vol. III. (1849).

Continental Navy. During the summer and fall of 1775, the British attempts to subdue resistance in the colonies on land was supplemented by harrying their shipping and coasts by sea. Several merchant vessels were made prizes in violation of law. Gloucester was fired on, and Bristol bombarded to obtain provisions. Most of the colonies equipped armed vessels for themselves, and commissioned privateers. On 5 October news came that two British transports were on the way to Quebec with military stores; and as our armies needed these worse than the British, Congress on the 13th appointed a board of three (Silas Deane, John Adams—afterward replaced by Christopher Gadsden—and John Langdon) to fit out two swift armed vessels and intercept these or any other store-ships. This board was the Navy Department of the Revolution for a time; it was turned into a marine committee, marine board, etc., with under boards called the Continental Naval Board, Board of Admiralty, etc. On 18 October Falmouth (now Portland) was bombarded and set on fire; and on the 30th two more and heavier vessels were authorized. The naval committee was doubled and made general managers of naval matters, subject to final decision by Congress, which appointed the officers down to third lieutenant—the "patronage" question being as burning here as in the Continental army. The beginnings of the American navy were curiously inauspicious for a nation of skilful and daring seamen, and for a body with so brilliant a subsequent record. The officers were largely incompetent, and the men mutinous. A brilliant exception was Capt. Manly of the schooner Lee, who captured several prizes, including a brig loaded with heavy guns, mortars, and tools.

Finally, on 25 Nov. 1775, Congress gave up the grisly pretense of being at loyal peace with Great Britain, and declared all ships of war employed against the colonies, and all supply tenders for them, lawful prize; authorized privateering and colonial courts to try prizes; adopted rules and regulations for a Continental navy; and on 13 December directed the marine committee to built and fit out five 32-gun frigates, five 28's, and three 24's, by April next. These were estimated to cost $866,666.66, and were to be built at the leading colonial ports from Portsmouth to Baltimore, and elsewhere (Norfolk, Charleston, etc.), if thought advisable. Other vessels might be bought and equipped. On 22 December Esek Hopkins was made commander-in-chief. Among the first lieutenants was John Paul Jones. On 9 November two battalions of marines were authorized. By January eight cruisers had been collected at Philadelphia, and Commodore Hopkins started on a cruise, but was detained six weeks by the ice, and only got clear 17 February. He had been instructed to "annoy the enemy's ships upon the coasts of the Southern States"; but finding nothing of Dunmore's squadron, sailed to New Providence in the Bahamas, where a quantity of British military supplies were stored, stormed the place, and carried off a quantity of stores and 80 cannon, besides the governor and some leading citizens as hostages. On his return he fell in with some armed vessels, which he captured, and the 20-gun frigate Glasgow, which, after a spirited fight, escaped. Congress held an inquiry into Hopkins' conduct in June, decided that he had exceeded his instructions, censured him, and finally dismissed him. This did not encourage enterprise, and naval service became unpopular. No new naval commander was appointed, the President afterward being given that rank. The vessels, however, did some clever work, and captured many prizes; but the greater part of this service was accomplished by privateers. At the time of the Declaration of Independence our navy consisted of six regularly built war vessels and 19 merchantmen with naval armament, the whole with 422 guns. Against this the British had 78 men-of-war, with 2,078 guns.

Next in importance to the Bonhomme Richard's fight with the Serapis, the most creditable naval engagement of the war was Benedict Arnold's battle on Lake Champlain. The importance of the naval battles on this inland lake is hardly realizable now; but till the time of railroads the lake was the one route for a large invading expedition between Canada and New York or New England, enabling supplies to be transported where otherwise the mountains or the forests would have made it impracticable. The English had 29 vessels with 89 guns; four longboats with stores; 697 men of the regular navy; and Indian allies. Arnold had 15 vastly inferior vessels, with 88 lighter guns, and about 750 men ignorant of naval service. Several of Arnold's vessels had to be abandoned and destroyed; two were captured; but several were saved in spots the English could not reach, by Arnold's heroic risk of himself. The British loss was about 40, the American about 80. But the battle lost the British the campaign; the struggle had been so severe that Sir Guy Carleton, the commander, did not venture to assail Ticonderoga, and shortly after retired to winter quarters.

The most famous work done by the navy, however, resulted from commerce-destroying in British waters. Our fleets were nearly as much masters of the English Channel as the English were at the time of the Armada, though we never had more than three or four ships there at a time; for the English could not protect their own commerce. No other enemy ever disturbed the marine insurance rates, not even France across the channel; but in a short time now they rose to prohibitive rates, and the companies even refused to insure English bottoms at any premium, so that the Thames was crowded with French vessels. The alarm and fury of the English were shown not only in the execrations of "pirate" which they lavished on the lawfully commissioned war vessels and their captains and crews, and in the barbarous misusage of the latter with which they revenged themselves when they captured any, but in the abiding hereditary tradition of their writers: they then invented false accounts of John Paul Jones (q.v.), and still term him a "notorious pirate," although he was no more a pirate than Nelson, and much less than Rodney, who even turned pirate on his own people. In 1776–7 the Lexington was engaged in this work, and in 1778 was joined by the Reprisal; but the former was finally captured and the latter foundered. The Surprise was then secretly bought from England and fitted out at Dunkirk; but on her beginning to make captures the English government forced the French by threats to give her up. The Revenge was then bought, and became even more successful. But the most magnificent success was won by Jones (see BONHOMME RICHARD), in 1778–9. In the former year he closed a wonderfully successful 28 days' cruise in the Ranger — from 10 April to 8 May — by capturing the Drake, a more powerful vessel than his own. In the latter the marvelous engagement of the Bonhomme Richard with the Serapis, the most creditable naval victory of the world, dwarfs all else. See JONES, JOHN PAUL.

Meantime Congress had ordered the construction of three 74-gun men-of-war, five large frigates, and one or two smaller vessels; but as money ran short, they were never finished. At the end of 1778 the navy consisted of four 32-gun ships, two 28's, one 24, one 20, three 18's, one 12, and one 10 — 14 in all, with 332 guns; while England had on the American coast 89 ships with 2,576 guns. In 1779 the most notable events were the capture on 7 May of seven transports with about 50 guns and some 300 men, by a Boston squadron under Capt. J. B. Hopkins, son of the ex-commodore; that of eight prizes worth over $1,000,000, in July; that in August, by two Continental vessels on a short cruise, of six prizes with 54 guns; and on 7 May, the same day as the first, a most bloody and desperate action of an hour between two 12-gun brigs, the United States Providence and the British Diligent, in which the latter lost 8 killed and 19 wounded out of a crew of 53, or over half. In 1779 and 1780 Capt. John F. Williams won two brilliant victories in 14-gun and 18-gun Massachusetts State vessels. But on 13 Aug. 1779 a heavy disaster befell the waning little Continental navy. Three vessels, a 32, a 14, and a 12, accompanied a fleet of Massachusetts privateers to dislodge the English from a fort

near the mouth of the Penobscot; but, seven English war-ships coming up to reinforce the three already there, the privateers fled, and the Continental vessels had to be run up the river and destroyed. By the fall of Charleston four more — two 28's, a 24, and the celebrated 18-gun sloop Ranger — were captured or destroyed; another had been lost; and at the end of 1779 the navy had but six vessels left, so that it was very hard to run the English blockade. Officers and seamen were scarce also; for the English dreaded the American privateers and naval destroyers so much, few as they were, that they systematically refused to exchange prisoners, and connived at the destruction of the Americans in pestilential hulks or prisons. In October 1780 the Saratoga, after taking three prizes, which were recaptured, foundered; and in 1781 the Trumbull was captured after a fight against superior force in which she was crippled. But the small remnant still won some victories. The Alliance on 28 May 1781 captured a 16-gun and a 14-gun brig; and early in 1782 the Deane captured four vessels with 48 guns. In April 1782 was fought a very brilliant action by a privateer, one of the most remarkable of the war: the Pennsylvania State cruiser Hyder Ally, Lieut. Joshua Barney, having 16 6-pounder guns and 110 men, engaged the British sloop-of-war General Monk, with 20 9-pounders and 136 men. Despite this enormous disparity of force — 96 pounds of metal against 180 pounds — the American vessel forced the British to strike in half an hour, with a loss of 20 killed and 33 wounded, against 4 killed and 11 wounded. Another remarkable contest was won by a private Philadelphia cruiser, the Congress, off the southern coast. She had 20 guns, but was manned almost entirely by landsmen, seamen being unobtainable. On 6 Sept. 1781 she fell in with a British 16-gun sloop-of-war, the Savage, with her regular complement of seamen. In about an hour and a half, lying so close that the guns scorched the opposing gunners, and shot were thrown by hand, the British vessel was fairly shot to pieces, and forced to surrender, with a loss of 8 killed and 24 wounded, against 30 of both on the privateer. The last naval fight of the war was between the Alliance, Capt. John Barry, and a heavy English ship, which the former drove off during a run to Havana.

The Continental vessels lost during the Revolution numbered 24, with 470 guns. The British loss was 102, with 2,622 guns. The American navy and the privateers together captured about 800 prizes from the British. British privateers did not capture a single Continental vessel; American privateers captured 16 English cruisers, with 226 guns. Consult: Maclay, 'History of the American Navy,' Vol. I. (1893); Cooper, 'History of the Navy of the United States' (1839).

Continental System, a plan devised by Napoleon to exclude Great Britain from all intercourse with the continent of Europe. The history of the continental system began with the famous decree of Berlin of 21 Nov. 1806, by which the British islands were declared to be in a state of blockade; all commerce, intercourse, and correspondence were prohibited; every Briton found in France, or a country occupied by French troops, was declared a prisoner of war; all property belonging to Britons was accounted fair prize, and all trade in British goods was entirely prohibited. No vessel coming directly from Great Britain or British colonies, or which had been there since the publication of the edict, was to be admitted into any harbor, and all vessels attempting to avoid this edict by false declarations were to be confiscated, with all their goods, as British. The reasons assigned for this decree were, that Great Britain did not acknowledge the international law accepted by civilized nations, but treated every individual belonging to the country of the enemy as if found in arms; made even the crews of merchantmen prisoners of war; extended the right of conquest over merchantmen and private property, and the right of blockade over places and harbors not fortified; over the mouths of rivers; nay, over whole coasts and countries. But many of these measures had always been taken, in maritime wars, even by France herself, as long as she had the means. One great reason for this and all the subsequent decrees of Napoleon was that he considered Great Britain his inveterate enemy and the enemy of the political doctrines which took their rise from the Revolution.

Great Britain immediately directed reprisals against the Berlin decree, first by an order in council of 7 Jan. 1807, by which all neutral vessels were prohibited to sail from one port to another belonging to France, or one of her allies, or to a nation so much under her control that British vessels could not have intercourse with it. Every neutral vessel which should violate this order was to be confiscated with her cargo. A second decree of 11 Nov. 1807 was much more oppressive to commerce. By this all harbors and places of France and her allies in Europe and the colonies, as likewise every country with which Great Britain was at war, and from which the British flag was excluded, were subjected to the same restrictions as if they were closely blockaded; all commerce in the manufactures and productions of such countries was prohibited, and vessels engaged in such commerce were to be confiscated, as also all those vessels whose certificates showed that they were built in the enemy's country. Another order in council declared the sale of vessels by the enemy to neutrals unlawful, and the intended transfer of property void.

Hardly were these orders promulgated when France made counter-reprisals. By a decree of Milan of 17 Dec. 1807, aggravated by a decree of the Tuileries 11 Jan. 1808, every vessel, of whatsoever flag, which had been searched by a British vessel, and consented to be sent to Great Britain, or had paid any duty whatever to Great Britain, was to be declared denationalized, and to have become British property; and in every case such denationalized vessel, as also those which had broken the blockade declared against the Ionian Islands, or had sailed from a British harbor or British colony, or those of a country occupied by the British, or which were destined for any such ports, were declared good prize. In order the more effectually to annihilate the British commerce, the tariff of Trianon, respecting colonial goods, was proclaimed 3 Aug. 1810. This was extended by another decree of 12 September of the same year, and both were followed by the decree of Fontainebleau, 18 October of the same year, directing the burning of

all British goods. These decrees were to be executed with more or fewer modifications in all countries connected with France. The consequence was that the price of colonial goods rose enormously; a regular smuggling trade was carried on at different points; for instance, at Heligoland, which was sometimes so crowded with persons concerned in this business that a ducat was paid for a barrel to sleep in; thousands of substitutes for colonial goods, particularly for coffee and sugar, were invented, and a variety of manufactures grew up on the Continent which were the germs of very extensive and flourishing branches of industry. The system was abolished immediately after the fall of Napoleon.

Continentals, or **Continental Army,** the army of the United States during the Revolution. In May 1775, after the battle of Lexington, the Provincial Congress of Massachusetts requested the Continental Congress to assume control of the forces which had gathered around Boston. Further outside pressure led the latter Congress, in June, to vote for raising a "Continental army" (the name "Continental" in all these cases expresses the hope, long entertained, that Canada would join the revolt), and for a loan of $2,000,000 to support it. On the 15th George Washington was appointed commander-in-chief; then four major-generals were appointed, Artemas Ward, Charles Lee, Philip Schuyler, and Israel Putnam; and an adjutant-general, Horatio Gates. Lee and Gates were bitterly opposed in Congress, and were only confirmed by Washington's influence, as men of approved military capacity. It is curious that Congress was right and Washington wrong, and that Lee's treachery and Gates' incompetence and intrigue nearly ruined the cause and Washington together. The brigadiers appointed were general officers in colonial service, with two others; and the inferior colonial officers were confirmed in their rank and shortly given Continental commissions. For commissary-general was chosen Joseph Trumbull, son of the governor of Connecticut, Washington's right-hand man and adviser, who kept a great general store in Lebanon. There was a further reason for this. The food surplus of the country came mainly from three great valleys,—the Connecticut, the Hudson, and the Delaware; the last two were held by, or liable to raids from, the British during most of the war, and the Connecticut valley was the one rich farming country which the British could not molest. Hence the first two commissary-generals were both Connecticut merchants. Washington appointed his aide, Thomas Mifflin of Pennsylvania, quartermaster-general; and Dr. Benjamin Church of Boston was made director of the army hospital. There was no paymaster-general till late in 1776, when William Palfrey of Boston was appointed. On 12 June 1776 Congress voted to appoint a "Board of War and Ordnance" of five members; in 1777 this was changed to a "Board of War," to consist of three persons not members of Congress. This board has not left an enviable historical reputation; but it lacked neither ability nor patriotism. In part its troubles were due to civilian misunderstanding of and contempt for military claims and feelings; in part to the insistence by the States on their share of army patronage, as now of civil patronage, which drove some of the best generals from the service and contributed to Arnold's treason.

The army was constituted by taking into colonial pay the militia regiments of the various colonies, and enlisting others for a year. The number on the war office rolls during 1775 was 27,443, besides an estimate of 10,180 militia for a few months' service during 1776, 46,891 regulars, 16,700 militia as before. Had these all been in the field and good troops, and well equipped, they would have been fairly sufficient, though not what could or should have been raised; but half or more were on paper, the material was poor, the equipment insufficient, and the whole system incompatible with effectiveness. The term of enlistment was too short for the soldiers to learn their business; the militia absolutely refused to submit to discipline, and their insubordination affected the regulars. Washington during the campaigns of 1776 urged upon Congress a plan for a permanent army; that body sent a committee to the camp at Harlem Heights, and drew up a scheme generally in accord with his views, which Congress adopted. The "armies" of different sections were to be consolidated into one body, of 88 battalions with 750 men each, to be raised in the States according to population and resources; besides a Canadian regiment to be called "Congress' Own." The largest numbers, 15 battalions each, were to come from Massachusetts and Virginia. The men were to be enlisted for the war, with a bounty of 100 acres of land each at the end; officers, higher amounts; colonels, 500; and $20 bounty for each recruit. The States were to enlist their quotas, arm and equip them; and to appoint the officers from colonel down, though Congress was to commission them. But the plan worked slowly and poorly. Enlistments for the war were so few that a three years' term was substituted; to stimulate even these, Massachusetts began and other States continued the policy of greatly increasing the bounties, and towns and counties bid still higher; but this rather made the process slower, men waiting to see how high the bids would go. Washington was shortly invested with dictatorial powers to remove any officers under brigadier, and fill the vacancies at his discretion; and allowed to raise 16 extra battalions. This somewhat strengthened his scanty lines, and enabled him in a slight degree to rectify the mischief done by the State patronage, give commissions to good officers, and keep others from retiring. But even so, and despite incessant drafts from the militia, the total number of soldiers enrolled in 1777 was but 34,820 regulars and 10,100 militia; in 1778, 32,899 and 4,353; in 1779, 27,699 and 5,135; in 1780, when the Carolinas and Georgia were in British hands, and none of their troops were on the roll, 21,015 and 5,811; in 1781, when Cornwallis surrendered, 13,292 and 7,298. It would seem that if the British could have held out a little longer, or sent one more army to America, the Continental army would have melted into nothing without the country taking pains to keep it up.

The reason was not lack of men, nor any ruinous exhaustion of resources; it was simple administrative anarchy (see CONFEDERATION, ARTICLES OF), which could not collect and dis-

tribute the resources we possessed, and which left the soldiers half fed, less than half clothed, and for long periods unpaid. This was increased by a jealous dread of the army itself (see CINCINNATI, SOCIETY OF THE), bred by historical experience which they had as yet no other to countervail; they appreciated victories, but were not inclined to pinch themselves for daily supplies. In 1777 the soldiers' back pay was settled up in Continental money, at about 12 for one, though Massachusetts made good a part of the depreciation. Arrears steadily accumulated till the end of the war, though in 1778–9 a half-pay system for seven years was provided for the officers, and a gratuity of $80 for the men. In January 1781, the Pennsylvania regulars struck, and were pacified with difficulty and by certificates for their pay; the New Jersey troops followed suit; and Congress in alarm made requisition on the States for $879,342 to pay the arrears. About half the amount came in, and Massachusetts and New Hampshire sent gratuities to their men; but the rest lagged. About this time the Articles of Confederation were adopted, making the consent of nine States necessary for appropriations; Congress was even more helpless than before; and as the time of a general disbandment drew near, the officers began to fear that it was intended to turn them off without paying them, and if they did not receive it while in the field they never would. Meantime Congress was debating the subject. The later Federalist party wished to fund the army dues as well as the other public debt, and give the army interest-bearing certificates; the decentralizers wished to leave it to the States to settle each with their own troops. The officers, finding the half-pay project highly unpopular, wished to commute it for a lump sum, in cash or securities. About this time, 10 March 1783, an anonymous letter called a meeting of the officers in camp at Newburg, and an anonymous address suggested that if Congress refused justice, they should desert the country in a body, under Washington's lead. Washington denounced this call as seditious, but called a meeting himself, at which his influence kept patriotism uppermost; but he wrote urgently to Congress, and it finally agreed to commute the half-pay into five years' full pay in certificates at 6 per cent interest. The States were very indignant at this, New England especially denouncing the whole scheme of half-pay: the Massachusetts legislature passed a resolution that it tended to "raise and exalt some citizens in wealth and grandeur to the injury and oppression of others." The soldiers were furloughed on three months' pay till the British should evacuate New York, when they were discharged. The number of troops nominally furnished by each State is as follows:

Massachusetts, 69,907; Connecticut, 31,939; Virginia, 26,678; Pennsylvania, 25,678; New York, 17,781; Maryland, 13,912; New Hampshire, 12,497; New Jersey, 10,726; North Carolina, 7,263; South Carolina, 6,417; Rhode Island, 5,908; Georgia, 2,679; Delaware, 2,386. Total, 231,791.

Adjutant-generals: Horatio Gates of New York, Joseph Reed of Pennsylvania, Timothy Pickering of Massachusetts, Alexander Scammell of New Hampshire, Edward Hand of Pennsylvania.

Quartermaster-generals: Thomas Mifflin of Pennsylvania, Stephen Moylan of Pennsylvania, Mifflin again, Nathanael Greene of Rhode Island, Timothy Pickering of Massachusetts.

Commissary-generals: Joseph Trumbull of Connecticut, Jeremiah Wadsworth of Connecticut, Ephraim Blaine of Pennsylvania.

Director-generals of hospitals: Benjamin Church of Massachusetts, John Morgan of Pennsylvania, William Shippen of Pennsylvania, John Cochran of New Jersey.

Paymaster-generals: William Palfrey of Massachusetts, William Pierce of Georgia.

Inspector-generals: Thomas Conway, Baron Steuben.

Chief engineers: Louis L. Du Portail, Thaddeus Kosciusko.

Contin'gent, a name often given to the quota of troops furnished by each member of a number of states composing a federation.

Continuity of State of Matter. See CRITICAL POINT.

Contorniati, kŏn-tôr-nē-ā'tē, ancient medals which have occupied the attention of antiquarians for a long time, and, on account of their rarity, are highly esteemed in cabinets. They are formed of a thin plate of metal (not of two different sorts, as is often supposed) with a flat impression. They differ from other ancient coins by having a furrow upon both their sides, where the others have a wreath of pearls. These hollowed lines (It. *contorni*) may have occasioned their name. Another characteristic of genuine *contorniati* is a cipher composed of the letters EP or PE, of which no satisfactory explanation has as yet been discovered, together with numerous impressed characters, and a great number of palm branches, the cavities of which are often filled with silver. They are also added by a second hand, and thereby are essentially distinguished from the "monograms," so called in the language of the mint. They resemble the *signa incusa* (*contremarques*) on the Roman medals. All the *contorniati* are of bronze, and equal in size to the large bronze coins called *medaglioncini* by the Italian collectors. Their form is various, their workmanship rude, and their inscriptions are frequently different from the usual curial style upon the ancient coins. From these circumstances we may conclude that they did not belong to the age of the Roman emperors whose images they bear, but to a later one. Eckel, in his masterly treatise on the *contorniati*, follows the opinion of Morelli and Mahudel, who consider them to have been made from the reign of Constantine the Great to that of Valentinian. It has been ascertained that they were not struck by public authority; and the ancients have transmitted no account of their destination, which must, therefore, be left to conjecture. The frequent representations of race-grounds, palms, men shouting to the charioteers, and even the images of the emperors upon them, make it probable that they were distributed as tickets of admission to the circuses in Rome and Constantinople.

Contour, kŏn-toor', the outline or defining line of any figure or body; also the horizontal outline of works of defense. When the conformation of the ground or works is described by contours or horizontal sections, these sections are taken at some fixed vertical interval from each other suited to the scale of the drawing or the subject in hand, and the distances of the surface at each interval above or

below some assumed plane of comparison are given in figures at the most convenient places on the plan.

Contraband of War (Lat. *contra bannum*, "against the proclamation") is a name applied to certain commodities during hostilities between states which acknowledge what are called the laws of nations. One such law is, that neutral nations must not carry on, for the advantage of either of the belligerent powers, any branches of commerce from which they are excluded in time of peace. Another is, that the name of contraband of war shall be given to such articles as pertain to military or naval warfare — guns, ammunition, and stores of all kinds. Unless there are special treaties, defining exactly what articles are contraband of war, the interpretation of this law often leads to much embarrassment. Another law insisted on by England during the Napoleonic war was, that each belligerent shall have a right to visit and examine neutral ships, to see whether they carry any articles which are contraband of war, and which seem likely to be intended for the enemy. A neutral state may carry on ordinary trade with either belligerent except when prevented by blockade (see BLOCKADE); but the ships, according to the above rules, must not contain articles contraband of war; nor must a conterminous land frontier be crossed by such commodities. If a merchant evades these rules, he does so at his own risk; his merchandise may be seized, and his own government will not protect him. At various times discussions have arisen whether corn, hay, or coal can ever be included in the list of articles contraband of war; they are obviously articles of peaceful commerce; but they are also essential to the maintenance of an army, and sometimes a supply would give one belligerent a greater vantage over the other. Especially is this the case in reference to coal in the present age of war-steamers, so that there has arisen a distinction between absolute and occasional contraband, the commodities just mentioned being occasional. Gen. B. F. Butler soon after the outbreak of the Civil War solved the question of the status of southern negroes, who had taken refuge with the Union army and were demanded back by their masters, by asserting that they were contraband of war, a claim with little legal basis, but of much convenience to the Federal authorities.

Contrabass, kŏn'tra-bās, or **Double Bass,** the largest instrument of the violin kind. Originally it had only three strings, but now it has generally four, the lowest tuned to E below the bass stave, the others to A, D, and G of that stave. Some players still prefer the three strings, but four are required in orchestra playing.

Contract, an agreement between two or more parties to do or not to do a particular thing, upon a sufficient consideration. Executed contracts are those in which nothing remains to be done by either party, and where the transaction has been completed, or was completed at the time the contract was made, as where an article is sold and delivered and payment therefor is made on the spot. Executory contracts are those in which some act remains to be done, as when an agreement is made to build a house in six months, to do an act before some future day, or to lend money upon a certain interest payable at a future time. Express contracts are those in which the terms of the contract or agreement are openly and fully uttered and avowed at the time of making, as to pay a stated price for certain goods, to deliver a horse, etc. Separable contracts are those the considerations of which are by their terms susceptible of apportionment or division on either side, so as to correspond to the several parts or portions of the consideration on the other side. Simple contracts are those not of specialty or of record. Specialties are those which are under seal, as deeds and bonds. Unilateral contracts are those in which the party to whom the engagement is made makes no express agreement on his part. Verbal contracts are simple contracts. Written contracts are those evidenced by writing. Every contract should be so complete as to give either party his action upon it; both parties must assent to all its terms. To the rule that the contract must be obligatory on both parties there are some exceptions, as the case of an infant, who may sue, though he cannot be sued on his contract. There must be a good and valid consideration, which must be proved though the contract be in writing. There is an exception to this rule in the case of bills and notes, which are of themselves *prima facie* evidence of consideration. And in other written contracts, when consideration is acknowledged, it is *prima facie* evidence thereof, but open to contradiction by parol evidence. There must be a thing to be done which is not forbidden by law, or one to be omitted which is not commanded by law. Fraudulent, immoral, or forbidden contracts are void. A contract is also void if against public policy or the statutes, even though the statute be not prohibitory, but merely affixes a penalty. In the construction and interpretation of contracts the intention of the parties is the pole-star, but their intention must be found expressed in the contract and be consistent with rules of law. The court will not make a new contract for the parties, nor will words be forced from their real signification. The subject-matter of the contract and the situation of the parties is to be fully considered with regard to the sense in which language is used. The legality of the contract is presumed and is favored by construction. Words are to be taken, if possible, in their comprehensive and common sense. The contract will be supported rather than defeated. All parts will be construed, if possible, so as to have effect. Construction is generally against the grantor.

Contract Notes, the same as bought and sold notes (q.v.).

Contractility. See MUSCLE.

Contrac'tions, abbreviations employed with the view of saving labor in writing, and also in former times with the view of saving parchment in extending MS. copies of works, deeds, etc. Contraction takes place in several modes, as by elision; writing a smaller letter above the word contracted; running two or more letters into one character; by symbols representing syllables or words; by initial letters: thus: rec'd for received; Mr. for Master, or Mister; & for and; p for per; S.P.Q.R. for *Senatus populus que Romanus.* When the contraction consists of the initial letter, syllable, or syllables of a word, as ult. for ultimo, it is

more correctly termed an abbreviation. See ABBREVIATIONS.

Contrat Social, kôn-trä sō-sē-äl, a work by Jean Jacques Rousseau, embodying his political ideas and defending the sovereignty of the people. It was published in 1762 and was one of the powerful influences affecting the leaders of the Revolution.

Contravalla'tion, a line formed, in a siege, in the same manner as the line of circumvallation, to defend the besiegers against the sorties of the garrison, so that the troops carrying on the siege lie between the lines of circumvallation and contravallation. As the line of contravallation must be out of reach of cannon-shot from the place besieged, its circumference is necessarily so great as to render both its erection and its defense difficult. It is, therefore, seldom resorted to.

Contravention, an act done in violation of a legal obligation or condition; most frequently applied in Scotch law to any act done by an heir of entail in opposition to the deed of entail, or to the action founded on a breach of law-burrows.

Contrayerva, kŏn-trạ-yĕr'va (Span. *contrayerba*, counter herb), the aromatic bitterish rootstock of *Dorstenia contrayerva*, a plant imported from tropical America, and used as a stimulant and tonic. The drug was once in much repute in low fevers, and was considered efficacious against snake-bites, whence the name. See DORSTENIA.

Contreras, Hernando de, är-nän'dō dā kŏn-trā'räs, Spanish adventurer: b. Spain about 1520; d. Panama May 1550. He was the son of Rodrigo de Contreras (q.v.), governor of Nicaragua. After the fall of his father, and the confiscation of his property, Hernando and his brother, Pedro, with a number of dissatisfied officers, arranged a plot to seize Peru and Panama, which the brothers claimed as inheritors of the estate of their grandfather, Pedrarias. Hernando was to be king of the new realm, but was never proclaimed, as the failure of his attempt within two months made such a course impossible. Panama was captured 20 April 1550, after several Church dignitaries had been slain, and a large part of the royal treasure stored in the city was taken. Hernando took a considerable part of his force to pursue one of the royal officers, leaving Pedro in command at Panama. The citizens improved the opportunity to retake the city, and Hernando was drowned shortly afterward. The other brother was never again heard of.

Contreras, Juan Senen de, Spanish general: b. Madrid 1760; d. there 1826. He entered the Spanish army in youth, in 1778 took an active part in the Austrian campaign against the Turks, and in 1795 commanded against the French. While captain-general he gallantly but unsuccessfully defended Tarragona and was captured by the French. He was imprisoned in the castle of Bouillon on the Belgian frontier, but escaped in 1812, and two years later returned to Spain. His narrative of the siege of Tarragona formed the third volume of 'Mémoires relatifs aux révolutions de France et d'Espagne' (1825).

Contreras, Rodrigo de, rōd-rē'gō dā, Spanish cavalier: b. Segovia, Spain, about 1495; d. Peru sometime after 1557; the last date when he was known to be living. He was appointed governor of Nicaragua in 1531, and sent an expedition into the interior, which discovered and explored Lake Nicaragua. The expedition had trouble with the adventurer, Robles, who tried to seize the newly discovered country, but was defeated. The administration of Contreras was turbulent and marked by constant disputes with the royal authorities and the dignitaries of the Church. Finally he was formally charged with various crimes and misdemeanors, found guilty, driven from the country, and all his property confiscated (1549). He vainly sought redress from the Spanish government, and finally returned to America, going to Peru, where he was not heard of after 1557. For the attempt of his sons to avenge their father's alleged wrongs, see CONTRERAS, HERNANDO DE.

Contreras, Battle of (Mexican name, *Padierna*), in the Mexican war, 20 Aug. 1847. At Churubusco (q.v.), the main road south from the City of Mexico is joined from the southwest by another, running to the hills beyond the hamlet of Contreras. This is about 12 miles from the city; a mile nearer the latter is the hamlet of Padierna. Both villages are on the same small stream; and each is about four miles northwest of San Augustin on the main road, to which the American army had advanced. Just west of Padierna, rising from the banks of the stream, is a ridge called Pelón (Bald) Cuauhtitlan, whose northern side is encircled by another brook, joining the first half a mile north of Padierna. The road to Mexico city winds around the east flank of the ridge, across the brook from Padierna; and crosses the other brook at Auzaldo; west of this, reached by a bridle-path across a third brook, is the village of San Geronimo; while the road keeps on north, across this third and a fourth brook, to the important village of San Angel. Between San Augustin and the first stream lies a field of *pedregal* (rough volcanic rock), four miles wide and running several miles north; it had a wagon road for a mile and a half, but the rest was only practicable for infantry picking their way in open order. The Mexican general, Valencia, with the "Veterans of the North," forming the right of Santa Anna's army, had made his headquarters at San Angel on the 17th; and he decided to occupy and fortify Pelón Cuauhtitlan, two miles southwest, to block the road to the capital skirting it. Powerful batteries were placed to command this and sweep the pedregal; and some 7,000 men were concentrated about the ridge, and facing Auzaldo and San Geronimo. Santa Anna, apprehensive for his position on the main road, ordered Valencia to retire to Churubusco; but Valencia refused. On the 19th Scott, at San Augustin, ordered a road leveled across the rest of the pedregal to Padierna; Twiggs and Pillow to check the enemy meanwhile. When this engagement was sharply in progress, Bennet Riley's brigade, shortly followed by P. F. Smith's, moved north and west across the pedregal and a stony hillock called Zacatepetl; crossed the streams and the San Angel road far in rear of the bridge, driving off in a fierce running fight the Mexican troops which attempted to bar the way; and

quartered themselves at San Geronimo in the hills north of the ridge. Valencia sent for reinforcements to Santa Anna, who brought a division to the hill of Toro, north of San Geronimo, and had the American brigades in a helpless trap if he chose, between his forces on the north and Valencia's on the south; but he did nothing, and at nightfall fell back to San Angel without notifying Valencia. At 2.30 A.M. of the 20th, a dismal morning of cold, rain, and fog, Smith and Riley moved southwest through the steep, gullied, slippery streets of San Geronimo, and unperceived, gained positions southwest of the ridge on the right flank of Valencia's lines, which fronted to the pedregal and Padierna; Smith on a height facing the ridge, Riley masked by a ravine, and Cadwalader east along the ravine, which lay between the ridge and Contreras. Meantime a strong diversion was made by an assault on Padierna and along the pedregal. These preparations were made with the greatest strategic skill, and carried out with the utmost courage and tenacity; but most of them were hardly needed, for the battle was won by a single impetuous onslaught of Riley's troops against Valencia's main batteries on the ridge, when the "Veterans of the North" broke and scattered like sheep. The battle was over in 17 minutes, and the Mexican army a routed mob, in face of a force numbering but a fraction of their own. Shields, who had taken Smith's place at San Geronimo, marched rapidly to Auzaldo to cut off the retreat; but a portion of the army escaped in wild flight toward Churubusco along the San Angel road, while the rest plunged in disorder down the steep flanks of San Geronimo, leaving all impediments behind. No more brilliant victory was won in the war. Scott had not over 4,500 men in sight, to Valencia's 7,000, and Santa Anna's 12,000 within supporting distance; and the natural and artificial defenses should have made the Mexican positions impregnable. The latter lost 700 killed and wounded, and 813 prisoners, including 88 officers, four of them generals; 22 brass cannon, vast quantities of small arms and ammunition, and many hundreds of pack-mules and horses. The American loss was 60 killed and wounded. This rout contributed materially to the winning of Churubusco. Consult: Wilcox, 'History of the Mexican War'; Wright, 'Life of Scott'; Scott, 'Autobiography.'

Contributory Negligence. See NEGLIGENCE.

Contumacy, kŏn'tū-ma-sĭ, the offense of non-appearance in court of a person summoned judicially, chiefly known in countries on the European continent. In civil causes a person in such case may be properly made liable to a decision against him, for his neglect in not appearing to defend his rights; but by an extension of the principle to criminal cases persons are often sentenced, in their absence, to punishment *in contumaciam*, as it is called, particularly those who are charged with political offenses, who can expect little justice under despotic governments.

Contu'sions, the lesion of the body resulting from a blow struck by a blunt instrument without breaking of the skin or fracture of a bone. Contusions may involve the skin alone, or they may produce some change in the deeper tissues. In contusions there is, as a rule, some rupture of blood vessels. This results in the extravasation of blood, which, if small in amount, causes minute spots called petechiæ. When elongated in stripes such hemorrhages are called vibices; or, when irregular and small, ecchymoses. When the hemorrhage is large and collected in one place, they are termed hematomata. Contusions, if very severe, may result in gangrene, hence all large contusions need prompt medical attendance, but small contusions may be treated with hot water in which there is some antiseptic, as a one-per-cent solution of carbolic acid; and if carefully bandaged and kept from being infected, they usually recover.

Conus, a genus of gasteropodous mollusks, the type of the family *Conidæ* or coneshells, so named from the form of the shell. They are found in the southern and tropical seas. The genus comprises several hundred species, some of them having very beautifully colored shells which are much prized by collectors. The rarest and finest of these is *C. gloria-maris.* All have a short, strong foot bearing a water-pore, two tentacles with eyes set on the outside at the centre, and a long syphon. They live in holes in rocks and in the clefts of coral-reefs, and their food consists mainly of other mollusks. Some of the species are poisonous.

Convallaria, kŏn-va-lā'rĭ-a, the typical genus of the natural order *Convallariaceæ*, or lily-of-the-valley family. The order has 23 genera, and about 215 species, widely distributed. Ten of the genera are found in the American flora, among them: *Asparagus, Clintonia, Polygonatum convallaria,* and *Trillium* (qq.v.). See LILY-OF-THE-VALLEY.

Convec'tion of Heat, the transference of heat by means of the upward motions of the particles of a liquid or gas which is heated from beneath. With practically one exception, namely, water below its maximum density point, liquids and gases increase in volume on being heated, and their densities therefore decrease. Hence, if heat be applied beneath a vessel containing a liquid or a gas, the parts nearest to the bottom, becoming heated, rise up owing to their diminished density, their place being taken by cooler fluid rushing in from the sides and falling down from the upper parts of the vessel. Hence a rapid mixing takes place, and it is thus that a liquid heated at the bottom becomes so much more quickly warmed than it would be were the heat applied at the top. The convection currents may be beautifully shown by filling a flask or glass with water, and dropping into it a small bit of indigo or other such solid coloring matter. On placing the flask over a spirit-lamp, streams of heated liquid will be seen rising and carrying the blue particles; while at the same time the cool water, uncolored, will be observed falling in downward streams and taking the place of that which is rising. See HEAT.

Con'vent (Lat. *conventus*), primarily the community of monks or nuns occupying a monastery, priory, or other establishment of a monastic or semi-monastic character. But the word is generally used to designate rather the establishment itself, if it is simply a cloister and not a considerable monastery or an abbey. The parts of a properly equipped conventual establishment are: The church or chapel including the choir,

namely, that portion of the church in which the members assemble to recite or chant the psalms, etc., of the canonical hours; the chapter-house, an apartment in which the inmates assemble to deliberate or discuss community affairs; the cells, or separate quarters of the inmates; the refectory or dining-hall; the dormitory; the infirmary; the parlor for reception of visitors; the library; the treasury; the cloister, an enclosed space for recreation; and the crypt, the convent's place of burial. The word "cloister" is also used in the sense of convent: in that use cloister signifies a religious house access to which is restricted by the laws of the Church.

In the United States, owing to religious upheavals going on in the Old World, a very large number of the religious consecrate of the Roman Catholic Church have found refuge. One of the oldest of our commonwealths, that of Maryland, was settled by the Roman Catholics, who at an early date laid the foundations of numerous convents and monasteries. As the settlements and centres of population pushed further in every direction from the Atlantic coast, the emissaries of the Church were in the van, and the result has been the building and organization of some of the most noted convents in the world. Scarcely a large town in the country is without its convent or nunnery, while in many of the larger cities there are several communities of either sex. The term convent is here applied almost exclusively to an establishment containing a sodality of nuns, the male religious being denominated monks and their establishments monasteries.

It is said that the first convent in England was erected by Eadbald at Folkestone in 630, and the first in Scotland at Coldingham in 670. They were numerous during the Middle Ages. Henry VIII. suppressed them, confiscating their revenues. By the Roman Catholic Emancipation Act of 1829 their erection in the United Kingdom was prohibited, but the Act was from the first so much of a dead letter that they were established in various places with no protest from the community in general. For a long time convents in Great Britain were founded by the Roman Catholic Church only, but in 1875 one was opened at Bournemouth under the auspices of the Ritualist party in the Established Church. Consult Murphy, 'Terra Incognita.' See MONACHISM.

Conven'ticle, a private assembly or meeting for the exercise of religion. The name was at first given as an appellation of reproach to the religious assemblies of Wickliffe, and afterward applied to meetings of petty sects and dissenters generally in the Conventicle Act, 22 Charles II., c. 1, repealed by 52 George III., c. 155. In strict propriety the word denotes an unlawful assembly, and cannot therefore be justly applied to the legal assembling of persons in places of worship licensed according to law.

Convention, Nominating. See ELECTIONS.

Convention of 1787. See CONSTITUTION, FRAMING OF THE.

Conventionalists, in Pennsylvania politics. The Pennsylvania Democrats obtained their first victory over the Federalists in 1799, electing their governor, Thomas McKean, and a majority of the House; but the Senate was Republican, and the electoral vote in 1800 was divided, eight Democratic to seven Federalist. Yet in the legislative session 1805–4 there were only five Federalists in the House and one in the Senate. This rapid conversion of Federalists to Democratic politics, however, by no means implied a corresponding conversion to Democratic ideas, and the victorious party almost at once split into two factions: the "Constitutionalists," or moderates of the Federalist temperament; and the "Friends of the People," or radicals, who wanted a new State Constitution, impeachment and removal of the existent judges, and limitation of the power of the judiciary for the future. The struggle, in fact, was part of that which has ended in making judges mostly elective; and which was begun by the wrath of the Democratic section at seeing the Federalist judges intrenched in position for life, and construing the constitutions their own way. The leaders of the two parties were William Duane and Michael Leib. In 1805 the Federalists adopted the candidate of the Constitutionalists, McKean, and elected him; but in 1808 the "Friends of the People" — who had adopted a programme for practical action, and now called themselves "Conventionalists," as wishing a convention to prepare a new Constitution — elected their candidate, Simon Snyder, and had a long lease of power.

Conventions, Constitutional, in the United States. The State constitutions framed during the Revolution (see CONSTITUTIONS, STATE, FIRST FORMATION OF) were made by various bodies — the regular legislatures, special conventions, committees of safety, etc. — and mostly not submitted to the people, whose understood wish was their sole guaranty of acceptance. But that of Massachusetts even then was worked out at a special convention and submitted to popular vote, and one or two of those previously adopted were shortly superseded by new ones so sanctioned. Since the Revolution this has been a very general method, and the submission to popular vote almost universal, alike in new States and the revisions of old constitutions. The exceptions have always been revolutionary in character, justified or unjustified, but precisely opposite to those of the Revolution: the forcing upon a State of a constitution which the leaders of the movement knew would not be sanctioned by the majority of the people. The Lecompton Constitution of Kansas, 5 Sept. 1857, making it a slave State and forbidding emancipation laws, was one example; recent constitutions in the Southern States disfranchising negroes are others. The constitutional convention, as a special body alone permitted even to propose for public action changes in the fundamental law, is peculiar to the United States. In foreign countries the regular lawmaking body has this function, though it may call a special session for it, or a specially heavy majority be required for it; no country would overturn its settled institutions by a majority of one. The American plan, of confining the legislative body to changes within the organic framework, and requiring specific popular consent to alterations of the latter, was initiated largely at the advice of John Adams. This formal constitutional convention is the exact reverse of the revolutionary convention in this and other countries. The latter by its essence is the overthrow of existent

legal sanctions by force, and the use of this revolt to establish new ones; the former is called in pursuance of legal provisions or prescriptive understandings, by a regular government to amend its own basis. Hence also it is restricted to the special purposes of its call, and so far as it transcends them it becomes revolutionary. The convention which framed the Constitution of the United States was semi-revolutionary: it was legally called, but it utilized the call to propose and submit a plan for discarding the entire system of government and substituting a new one; its excuse was national necessity, its bill of indemnity the ratifying of the Constitution by the States. The method of convention is by no means universal or obligatory, however. Some States provide for the adoption of the desired amendments in two successive legislatures, and then their submission to the people; some allow either; some make no provision at all; some merely disallow any changes not agreed to by certain majorities or legislatures.

Conventions. See ELECTIONS.

Conventions, Revolutionary (see also CONVENTION, CONSTITUTIONAL; CONSTITUTIONS, STATE, FIRST FORMATION OF). Where the legal governments of countries have become the very grievance against which people rebel, the latter have no organ of expression save tumultuous or representative popular assemblies. The latter are usually called conventions. Thus, in England, the convention parliament of 1399 deposed Richard II. and gave the crown to Henry IV.; that of 1660, after the downfall of Richard Cromwell, proclaimed Charles II.; that of 1689, after the flight of James II., proclaimed him abdicated and William III. king. These were simply parliaments, except that there was no royal authority to call them. In Massachusetts, the convention of May 1689, at the same time as that in England, superseded the Andros government by one of the people. That of South Carolina in 1718, to form a provisional government in place of the proprietary government, is another instance. In all these cases, the conventions were administrative bodies, governments pro tem. So during the Revolution, when the royal governors proclaimed the colonial assemblies dissolved, they were in the habit of reassembling as conventions, and they constituted the provincial government until regular constitutions were in force, which in fact they often framed and adopted themselves. The later constitutional conventions, creatures of State law, and limited to the preparation of a plan of government to be afterward voted on, have nothing whatever in common with the above, and are in fact only enlarged consulting boards, representative enough to imply fairly the entire public feeling. Of the first sort were the nullification convention in South Carolina in 1832 (see COMPROMISE OF 1833), and the secession conventions of 1860 and 1861.

Convergence. Cases often occur where two animals of different groups, with a different ancestry and affinities, but with similar habits, so closely resemble each other that not only the ordinary observer, but the experienced naturalist, is deceived by their close resemblance. A familiar example is the whale, which so resembles a fish that by many it is even supposed to be one. Now, the whale is a mammal, bringing forth its young alive, and suckling it. The cetaceans form an order by themselves. There are strong reasons for believing that they are the descendants of some group of land vertebrates which walked on all fours, but which, perhaps driven by competition, were forced to adopt marine life, and became wonderfully adapted to an aquatic life, during this process losing by disuse their hind limbs, while the fore legs became converted into fins. By adaptation to the same medium, a fish and a whale have a similar shape and a strong superficial resemblance. The same is the case with certain extinct whale-like lizards, such as the ichthyosaurs. These, with the plesiosaurs, are now supposed to have descended from some earlier four-footed terrestrial reptiles, which, becoming adapted to oceanic life, assumed a fish-like form.

Cases of convergence resulting from similar burrowing habits are seen in the *Amphibia* and reptiles. Certain amphibians (*Cæcilia*) and several extinct Carboniferous forms, have lost their limbs by disuse; they are worm-like, from adopting the habits of earthworms. Among the lizards the glass-snake (*Ophiosaurus*) and a few other forms have lost their legs in consequence of burrowing in the sand. There is a form (*Bipes*) in which a pair of legs are retained. Snakes have evidently descended from four-legged forms, the boas still retaining vestiges of the hind legs. It is not an easy matter to separate some of the legless lizards from small boas, owing to the convergence in their mode of life.

The thousands and tens of thousands of the boring larvæ of insects, belonging to quite different groups, have strikingly similar forms owing to their similar habits; thus the headless and apodous maggots of flies resemble those of ants, wasps, and bees. Among jumping mammals, the kangaroo, the jerboa, and jumping mice have similar large muscular hind legs, with a reduction in the number of toes, although they belong to different sub-classes or orders. The kangaroo is a marsupial and we have marsupial or kangaroo rats and mice which can be separated only by an expert from ordinary rodents. The koala mimics the bear, the pouched weasels look like genuine weasels, and so on.

A multitude of other examples can be cited to illustrate the effects of convergent habits, or the influence of similar conditions of life, or adaptation to such and such surroundings. It is most probable that the large majority, if not all, of the cases of mimicry among butterflies and other insects generally attributed to the action of natural selection, are examples of convergence, resulting from exposure to similar physical conditions of light, temperature, etc., which have produced similar styles of coloration, outlines in their wings, etc.

While convergence is not in itself a primary factor of organic evolution, use and disuse are such factors, and convergence in habits or modes of life, resulting in use or disuse of parts, have had much to do with the evolution of so extreme specialized groups as the whales, the snakes, the plesiosaurs and ichthyosaurs, as well as other minor groups of animals.

Convergence is of rare occurrence in plants, because their fixed mode of life does not admit of the exercise or disuse of parts or organs.

Conversano, kŏn-ver-sa'nō, Italy, a town in the province of Bari, on a hill, 18 miles southeast of the town of Bari. It is the seat of a bishop, and has a citadel, a handsome cathedral, several convents, a diocesan seminary, and a hospital. The district produces wine, oil, almonds, flax and cotton; and a good trade is carried on in these articles. The foundation of the town is attributed to the Etruscans. Pop. 9,731.

Conversation, the oral interchange of ideas among two or more persons. It may be formal or informal, in the latter sense differing little in meaning from "speech or talk." In its formal sense it is sometimes spoken of as "polite conversation," and it may cover a wide range of topics. As an art, conversation may be said to have flourished in the courts and palaces of Italy from the Middle Ages onward, and in the salons of France during the 16th, 17th, and 18th centuries. In England, in the 17th and 18th centuries, conversation was perhaps at its best. Some of the "polite conversation" of this period has been reserved in the form of "table talk," but some of this literature might be better described as "monologue."

Con'verse, Florence, American writer; b. New Orleans 30 April 1871. She graduated at Wellesley College in 1893, began writing for the magazines, and has been a member of the editorial staff of The Churchman (New York) since January 1900. She is the author of: 'Diana Victrix,' a novel (1897); 'The Burden of Christopher' (1900); 'Long Will, a Romance' (1903).

Converse, George Albert, American naval officer; b. Norwich, Vt., 13 May 1844. Educated at Norwich University, he was graduated from the United States Naval Academy in 1865, was in the torpedo service in 1869–72, instructor at the torpedo station (Goat Island, Newport Harbor, R. I.) in 1885–9, and in charge of the station in 1893–7. He was promoted commander in 1889 and captain in 1899. In 1897–9 he commanded the U. S. S. Montgomery, seeing service in the Spanish war; in 1899 was made chief of the bureau of equipment, with rank of rear-admiral; in September 1902 was assigned to the command of the Illinois; and in March 1904 became chief of the bureau of ordnance. He is regarded as one of the foremost ordnance experts in the navy.

Converse, Harriet (Maxwell), American philanthropist and author; b. Elmira, N. Y., 1839; d. New York, 18 Nov. 1903. For some years she traveled in Europe, contributing to the American press, and in 1883 published a collection of verses, 'Sheaves,' which passed through several editions. In 1884 she was formally made a member of the Seneca Indians, and for many years labored in defense of the rights of Indians both in New York and elsewhere. In 1891 she finally secured the defeat in committee of a bill introduced into the New York legislature with the purpose of depriving the Indians of their lands, and thereupon was elected a member of the Seneca national council and installed a chief of the Six Nations. She made valuable collections of Indian curios and antiquities. Among her further writings is 'Myths and Legends of the Iroquois Indians' (1903).

Converse, James B., American Presbyterian clergyman; b. Philadelphia 8 April 1814. He graduated at Princeton 1805, and Union Theological Seminary, Virginia. He edited the 'Christian Observer' 1872–9; was engaged in pastoral and evangelistic work 1879–88; and edited the 'Christian Patriot' 1890–5. He has published: 'A Summer Vacation Abroad' (1878); 'The Bible and Land: argument in favor of single tax' (1889); 'Uncle Sam's Bible, or Bible Teachings About Politics' (1899).

Conveyancing, a term including both the science and the act of transferring titles to real estate from one person to another. Sometimes it is applied in a restricted sense to the cumbrous forms which the feudal system has rendered necessary for the transference and tenure of landed property. When left to shape itself by individual practice, without legislative intervention, there were several causes rendering such conveyancing cumbrous and complex. The theory of the feudal tenures and hierarchy remaining unchanged throughout the social revolution which had substantially abolished superiority and vassalage, and brought land out of feudality into commerce, the feudal ceremonies of the Middle Ages were necessarily retained, and they were adopted by fictions and explanations to modern exigencies. It seems strange that not many years have passed since in Scotland, when a parcel of land was bought and sold, a party of men assembled on it and went through the old form of feudal investiture by the delivery of so much earth and stone from the superior bailiff to the vassal's attorney, who took instruments and had the whole recorded at length by a notary of the empire. In England, from the want of the general system of registration known in Scotland, the complexities of conveyancing had become so inextricable, that one of the most approved forms of transference was a fictitious suit and judgment of possession called a fine and recovery. To these various sources of complexity must be added the timidity of conveyancers, who, afraid to commit themselves by attempting to abbreviate or reconstruct the forms which they find in existence, repeat them with additions from time to time as new circumstances must be provided for. Consequently to keep conveyancing within rational bounds the legislature, both in England and the United States, has interfered from time to time, by sweeping away excrescences, and providing brief and simple forms. All instruments under seal are spoken of as deeds, but the term deed is usually understood as applying to conveyances of land. Every person capable of holding lands (excepting idiots, persons of unsound minds, and infants), seized of or entitled to any estate or interest in lands, may alien such estate or interest at pleasure, subject to the restrictions and regulations prescribed by law. In nearly all of the States of the American Union every grant in fee, or of a freehold estate, must be subscribed and sealed by the person from whom the estate or interest conveyed is intended to pass, or his lawful agent; if not duly acknowledged before its delivery, its execution must be attested by one or more witnesses (the number varies in the different States) and if not so attested it will not take effect as against a purchaser or encumbrancer until so acknowledged. A deed will not take effect, so as to vest the estate or interest intended to be conveyed, except from the time of its de-

livery. Almost any act of the party executing a deed, importing an intention to deliver it, will be sufficient, or it may be delivered as an escrow, on conditions, and will take effect on the performance of such conditions, from the time of the delivery. A deed should be founded on sufficient consideration, and it must not partake of anything immoral, illegal, or fraudulent.

Conveyer, a mechanism for conveying something, usually loose material, from one place, and depositing it at another place, distinguished in mechanics from a carrier. Conveyers may be divided into two general classes: those that operate with endless chains or belts, and those that travel along cableways or on a trussed support. These mechanisms have come into very extended use during the past 20 years, being employed in large excavating operations, and in handling coal, grain, cement, ore, and similar material. Their manufacture is carried on by a dozen or more concerns in the United States. One of the simplest and earliest forms of conveyer consists of a pair of endless chains, connected at intervals with cross-pieces or scrapers. These are used to pile up coal for storage. At the centre of what is to be the pile of coal a pole is erected, and to the top of this one end of the conveyer is attached, while the other end is located a little above the ground level, near a steam engine or other motive power. As coal is dumped within the space the scrapers convey it upward toward the pole, and as the lower end of the conveyer may be moved to any point in the circle about the pole, coal dumped anywhere in the circle may be smoothed up and pushed toward the centre, until all lies in a symmetrical pile.

A common form of conveyer consists of a sheet iron trough through which travels a linked belt or chain device having cross strips or scoops. Any loose material dropped in the trough is carried along by the scoops to the point where the linked belt bends for its return.

The Hunt conveyer consists of a series of sheet iron buckets or small cars, hung between parallel lines of flat links, that constitute chains. The buckets swing on trunnions or pivots placed above the centre of gravity, so that they always remain upright, no matter what is the inclination or route of the chains, until they reach a dumping or upsetting mechanism. The links have wheels that run on little tracks, so that the whole constitutes a miniature railway train. The cars or buckets will carry either liquid or dry material. This is called a noiseless conveyer, because the provisions for lubrication do away with all objectionable noise, the latter being a special nuisance with conveyers of the scraper type. The driving-wheel of the Hunt conveyer has a series of large pawls, that engage with pins on the links, and provide a slow, but steady and powerful motion. Capacity is obtained by the size of the buckets and not by speed.

Bucket conveyers, more or less similar to those just described, are commonly employed to supply large boiler plants with coal, and to carry away the ashes. In plants located by a waterway, such as that of the Arbuckle sugar refinery, the coal is hoisted in grab-buckets, direct from the hold of a vessel, and dumped into the buckets of a conveyer, which transports it to a large pocket or storage room located above the boilers. Thence the coal is fed through automatic stokers to the boilers. Running along below the boilers is another line of conveyer buckets that receives the ashes from the hoppers below the boilers and carries them out to a dumping place, which is often a large elevated hopper, from which the ash wagons can load by driving directly under it, and opening a discharge gate. All large railway terminal stations have a coaling-house arranged somewhat on the plan described. The coal is conveyed to overhead storage by the conveyers, and is dropped direct into the tenders as they come below. At the plant of the Philadelphia & Reading R.R. in Philadelphia monobar conveyers are employed, having a conveying capacity of 120 tons of coal an hour, while the set used to carry away the ashes dumped by the locomotives has a capacity of 20 tons an hour. Nearly all this capacity is needed at times, as the plant is sometimes called upon to load as many as 12 locomotives at once. The monobar conveyer referred to is of the scraper type, the scrapers being attached to a link-belt monobar chain, driven by equalizing gears. Bearing blocks are introduced to reduce the noise.

The Luther ore conveyer has met with considerable sale in Germany. This consists of a series of rectangular sheet-iron pans, moving on roller bearings. It travels quite swiftly, and is used for coal, ashes, sand, sugar, etc., as well as ore. When used for carrying coke, or any other material that tends to wear the metal pans, glass bottoms are employed, which give good satisfaction.

For lumber-mills and large wood-working plants a different style of conveyer is manufactured. The Schroeder Lumber Company's works at Milwaukee, Wis., afford a good example, being equipped with a sort of traveling sidewalk, consisting of parallel planks attached at right angles to two malleable iron chain belts. At intervals a thick plank is inserted to keep in place the hard wood lumber that is piled on to this conveyer, which is really a strip of moving floor for transporting boards to another part of the works. For handling waste ends and kindling, a smaller type of conveyer is used, having hoppers at intervals. Into one set of hoppers the machines that cut up the hard wood drop the end-pieces, etc. Into another set of hoppers the trimmings of soft wood are dropped, and both hard and soft wood are carried up an incline and dumped in an enormous hopper, where the hard and soft wood are kept separate, and may be withdrawn from below as wanted, for kindling or other purposes.

A conveyer has been devised for loading box cars, the loose material being introduced by a spout at the centre of the car, and carried by the conveyer to the ends, in such a manner that the ends are loaded high up, avoiding waste. These are used on the Hocking Valley Railway.

The belt conveyer is simply a long endless belt, supported at intervals by rollers or idlers, so shaped that they curve up the edges of the belt, enabling it to carry along material without spilling off. The belts are sometimes made of leather, but more commonly of cotton duck, faced with rubber. Such conveyers are used in grain elevators, and for ashes, cement, chips, clay, coal, concrete, earth, ore, oyster shells, tailings and the like. The storage tanks of grain elevators employ belt conveyers almost exclusively, the modern circular tanks having a

belt gallery that runs across the tops of the tanks and connects them. The belts thus distribute the grain from the main elevator to the several tanks.

In handling ore, labor is often reduced by means of sorting conveyers, which are made to serve the purpose of sorting tables, at the same time that they serve to convey the ore. These travel slowly, and men stationed at the sides examine the ore as it passes, breaking any pieces deemed too large for the process to which the ore is to be subjected. The large stone-crushing plants very commonly employ belt conveyers, as being the best adapted for handling broken stone. While belt conveyors are used to some extent for handling coal and ashes, they are restricted in use to inclinations of about 20°. For steeper work or direct elevation the bucket type of conveyer has to be employed. All the conveyers that operate with endless chains or belts normally deposit the material at the point where the chains or belts are curved over rollers or sprockets for return. For depositing the material at points along the route, various forms of trippers are manufactured, according to the nature of the conveyer and of the material handled. For filling a conveyer en route there are also in use numerous styles of fillers, many of them being simply spouts leading from hoppers, and others specially designed for the work they are to do.

The type of conveyer used on a cableway is radically different from the foregoing. A wheeled carrier is slung on a supporting rope, usually a steel wire rope, and from this carrier is hung the material to be conveyed. To the carrier is attached a rope, and a conveyer-engine at one end of the cableway pulls the load along to its destination. This is the system followed in coaling vessels at sea. The United States battleship Massachusetts was coaled in this manner during rough weather, the coal being carried aboard under these conditions at a rate of 20 tons an hour.

In excavating work, as the New York subway and the Chicago drainage canal, this type of conveyer is in constant use, owing to its economical construction and portability. The system is employed for handling sand, at glass works, etc.; for discharging cargo from a vessel to a shore where there is no wharf; for carrying material over rivers or rough land, as in new sections of country, where there are no good roads; for transporting the material used in building breakwaters and piers; in the building of dams and locks; and for a variety of purposes in connection with mines. A few conveyers have been built for permanent use, in which an overhead truss or bridge with a rail takes the place of the cableway.

In dredging and excavating there has been a great development of new machinery since 1885, some of which is sometimes called conveying machinery. A description of some of these will be found under the title EXCAVATING MACHINERY.

CHARLES H. COCHRANE.

Convict Labor. The introduction of industry into prison life, apart from its use to keep penitentaries in good order and good repair, is a product of 19th century reforms. Isolated cases it is true occur before. Mabillon, a Benedictine monk of the 17th century, urged a cellular system of imprisonment, labor in the cells, and gardens where prisoners might rest after the day's work. In 1704 Pope Clement XI. opened a prison at Rome, where the industrial feature proved successful in the case of boys. A famous prison built in Ghent in 1775 by Viscount Vilain XIV. had a well-organized labor system, intended to benefit the prisoner and make him useful to the state. Two years afterward John Howard published his work on 'Prison Reform.' But in practice before the beginning of the 19th century, and well into it, labor was considered in a penological bearing only as offering the possibility of severer punishment, an idea excellently typified by the Roman system of punishing the city slave by sending him to the country tread-mill, or by the terrible toil of the galley slave in Italy and France. This penal point of view was followed by the fiscal interest of the state and to a certain degree intermixed with it; the state will save, and if possible, make money by means of its use of the time and strength of the convict. Then the disciplinary interest became predominant; the convict will furnish us less trouble if we keep him at work. A further step is taken when the object of convict labor becomes moral and the prisoner is put to work to keep him from idleness, spring of so much vice, and to promote his ability to earn an honest livelihood upon his release. In the latest among these stages a distinct effort is made to furnish the convict with decent and pleasant work, and the old scheme of choosing the most revolting and dangerous, the most degrading and monotonous task has been done away with.

Unfortunately the evolution hinted at has not been completed, and traces of each of the ideals mentioned may still be found in the various systems of Europe and the United States. "At hard labor," for example, is still felt to be a degrading and aggravating addition to the sentence of detention. As far as actual business management is concerned there are two methods of convict labor. In the first, where the "product or profits of labor is shared by the state with private individuals or firms," we may mention three divisions, sufficiently characterized by their common names: the contract system, the piece-price system, and the lease system. The second general class, "systems under which convicts are worked wholly for the benefit of the state" or its parts, again falls into three divisions, the public-account system, the state-use system, and the ways and works system. Theoretically the piece-price system is best in the former class, as it keeps discipline in the hands of prison authorities and leaves business to the entrepreneur; moreover it lacks the faults of the contract system, which to a degree interferes with regenerating influences by the very monotony of highly specialized and largely divided industries. In the second class, the public account system, by which goods were made in prison, under the control of regular prison officers, and were sold in a rather haphazard way, has bulked so largely in the public eye, by reason of the attacks made on it by the representatives of free labor (who overlook the fact that cheaper production is offset by slower production), that the other sub-classes have been overlooked. Of these systems the most popular is that which provides that all results of convict labor should be used by the state, and yet this

as a system could equally well be attacked by labor unions, which naturally desire to supply state institutions as well as other sources of demand. Although it has but a limited field, the state-use system is growing; it is used in most of the northern States and is authorized by the Federal government for the Fort Leavenworth penitentiary.

The lease system calls for special notice. Its particular habitat is the South, where after the war a remodeling of the penitentiary system was demanded because of the addition of the negro factor to the problem, more than 90 per cent of convicts in most States being negroes. Both expense and the need of out-door work on the part of the negro made impracticable the continued use of walled penitentiaries, which moreover would have been quite inadequate under new conditions. The lease system came into general use in the late forties, and felons were worked in coal and iron-mills, saw-mills, and farms. A chief inspector had general charge, but the responsibility, which was scarcely more than nominal, was upon the lessee and his inspectors and physicians. In many States this system gave rise to horrible abuses. In Georgia it was abolished in 1897 and the State camp system put in its place. The death rate dropped from over 7 to 1.4 per cent in four years. Pay was allowed the prisoner who volunteered to do extra work, and the more brutal forms of corporal punishment abolished. But even in Georgia the county chain gang, made up of minor offenders, under supervision of county road commissioners, is still cruel and vicious. Worse than the county chain gang of Georgia, where only 45 per cent are hired to private individuals, is the system in other States. Alabama, notably by its contract law of 1901, which was declared unconstitutional in 1903 by a United States circuit court judge, made possible the following scheme of peonage: A minor offender and often a perfectly innocent person is sentenced to a light fine which the constable offers to pay for a certain number of months' work. At the expiration of this period a new charge is trumped up, or the negro induced to attempt escape, he is again tried and sent to the convict camp or fined for the benefit of the constable and his backers. The universal disapproval of this system in the South and the prompt action of the Federal authorities promise its immediate abolition.

On convict labor consult Vol. III. of the 'Report of the United States Industrial Commission' (1900); Liszt, 'Die Gefängnisarbeit' (1900); Wright, 'Prison Labor,' in the 'Catholic University Bulletin' (October 1899); and Roux, 'Le travail dans les prisons' (1902).

Convocation, an assembly of the clergy of England, belonging either to the province of Canterbury or to that of York, to consult on ecclesiastical matters. From the fact that the province of Canterbury is the more influential of the two, the Convocation of the province of Canterbury is often spoken of as "the" Convocation, as if there were only one. In both provinces the Convocation consists of two Houses, an upper and a lower. In the former sit the bishops, and in the latter the deans and archdeacons, along with the proctors, who represent the inferior clergy and the chapters of cathedral churches. In the Convocation of the province of York the usual practice has always been for all the members to sit in one House. Originally convocations were merely ecclesiastical councils that had no special privileges or recognized political status, but gradually they came to assume their present form, being endowed with the right of passing canons, of determining their own taxation, etc. When thus formed into an assembly, having certain political as well as ecclesiastical functions, there was only one Convocation for all England, and this lasted down to the beginning of the 14th century, when the clergy of the two provinces began to meet in separate Convocations. The archbishop of each province has the right of summoning Convocation, but he cannot do so without the royal consent, nor can the Convocation pass any canons without the same authority; and from its judicial proceedings there lies an appeal to the sovereign in council. In 1664 the practice of granting subsidies to the crown, in the exercise of the right of self-taxation enjoyed by the clergy, was discontinued, and since that time their functions have been mostly formal. In the reigns of William III. and Queen Anne the Convocation of the province of Canterbury recovered some degree of importance, but in 1717 that temporary influence was again lost, and from that year down to a recent period the practice was to prorogue the Convocation as soon as it had assembled. Since 1852, however, the Canterbury Convocation has met regularly two or three times a year for the transaction of business relating to the Church, and in 1861 it exercised its legislative power, the first time for a long series of years. On the opening of a new Parliament a new Convocation is summoned. If the crown desires to refer any question to Convocation, "letters of business" are issued, directing that question to be taken into consideration.

The term Convocation is also applied to the legislative bodies of the universities of Oxford and Cambridge.

Convolvulaceæ, kŏn-vŏl-vū-lā'sē-ē, or **Bind'weeds,** an order of herbaceous or shrubby plants, usually twining, with plaited corolla, imbricated calyx, alternate undivided or lobed and pinnatifid leaves; bell-shaped flowers, axillary or terminal; five free stamens; and fruit with two or three cells. Many of the order contain a milky and resinous juice possessing purgative properties more or less drastic. Jalap is derived from the *Convolvulus jalapa,* an inhabitant of Mexico and the southern parts of the United States; and scammony (*Convolvulus scammonia*) is a resinous substance possessed of nearly the same properties as jalap. Some species of the order have tuberous and fleshy roots containing a farinaceous and saccharine principle which fits them for food for man and beast. Among these is *Convolvulus batatas,* the sweet potato, originally from India or South America, but now cultivated in all countries where it can stand the climate. *Convolvulus dissectus* abounds in prussic acid and is one of the plants used in the preparation of the liqueur called noyau. The species of *Rhodorhiza* yield by distillation an essential oil called oil of rhodium, which has a bitter balsamic flavor. Their wood, when powdered, forms an agreeable snuff, and when burned is very fragrant. There are about 40 genera and 900 species widely distributed.

Convolvulin, kŏn-vŏl'vū-lĭn, the purgative constituent of jalap ($C_{34}H_{56}O_{16}$), obtained from the root by treatment with water and strong alcohol. The alcoholic extract is mixed with water, boiled with animal charcoal, filtered, evaporated, and treated with ether as long as anything dissolves. Pure convolvulin is transparent and colorless, brittle at 212° F., fuses at a higher temperature to a clear liquid, and is decomposed by strong heating. It is insoluble in water and ether, but soluble in alcohol. It has no taste or smell. In doses of two or three grains it is a powerful purgative, and in larger quantities is fatal to animals. By treatment with alkalies it is converted into convolvulic acid, and by acids into convolvulinol ($C_{18}H_{32}O_3$) and glucose.

Convolvulus, the typical genus of the natural order *Convolvulaceæ* (q.v.), or morning-glory family, formerly known as bindweeds. There are about 175 species widely distributed in temperate and tropical climates, some 15 of which are found throughout the southern and western United States.

Con'voy (Fr. *convoyer*, "to accompany"), in nautical language, a fleet of merchantmen bound on a voyage to some particular port or general rendezvous under the protection of a ship or ships of war. The name is also given to the ship or ships appointed to conduct and defend them on their passage thither. It is used in much the same sense as the military term "escort."

Convulsion, a disordered action of muscles, known by violent, purposeless, and involuntary contractions. Single muscles or groups of muscles may be attacked, and sometimes the whole body is convulsed; and the contraction of the muscle may be of a tonic or clonic character. In the latter case the muscular spasm is of short duration and soon recurs, each spasm alternating with a period of relaxation; while in the former case the spasm is prolonged, and after a more or less lengthened period passes off. The chief diseases in which convulsions are a characteristic feature are epilepsy, hydrophobia, tetanus or lock-jaw, and Saint Vitus' dance or chorea. They are common also in inflammatory affections of the brain, in meningitis, for example, water-in-the-head, and in other brain affections; and in women hysterical convulsions are not uncommon. Again, convulsions occur in some diseases associated with the introduction of poisonous material into the blood, or the retention of waste substances that should have been expelled. Convulsions in women in childbirth, or afterward, are connected with such a condition, as well as convulsions attending kidney disease. In children convulsions are more common than in adults, and are associated with a more readily excitable condition of the nerve-centres, especially of the spinal cord and an undeveloped controlling action of the higher brain-centres. Children are often the subjects of convulsions during dentition, particularly when accompanied by a disordered state of the bowels or the presence of worms; and often these two latter conditions are the sole cause of convulsions in young persons. In every case the immediate cause of the convulsion is an irritation of some part of the nervous system leading to a sudden and disorderly discharge of nervous energy to the associated muscles, which are thus thrown into contraction.

Convulsionists, or Convulsionaries, a sect of religious fanatics originating among the Jansenists of France about 1730. Three years previously a charitable and ascetic deacon of Paris, one Francis, died, and was buried in the cemetery of Saint Médard, in one of the suburbs of the capital. Reports of miracles wrought at his tomb spread among the people, and soon the cemetery was the scene of extraordinary manifestations. As the devotees approached the tomb, many were seized with convulsions, or took to dancing and contortions, accompanied by shouts and other eccentric demonstrations. Some of their utterances were accounted as prophecies miraculously inspired by the venerated dead. Most of them were directed to the support of the Jansenist doctrines; but some of the fanatics, by denouncing the throne, and predicting its downfall as well as that of the Church, drew the attention of the government and the ecclesiastical authorities. The cemetery was ordered to be closed; but the same virtue that seemed to be possessed by the tomb was also inherent in earth surreptitiously obtained from it, and the manifestations continued. Imprisonment failed to stop them, but the fanaticism gradually died out in about 20 years. An account of this sect was published in Paris in 1864, entitled 'Histoire des Miracles et des Convulsion-Saint Médard.'

Con'way, Hugh. See FARGUS, FREDERICK JOHN.

Conway, Katharine Eleanor, American journalist and poet: b. Rochester, N. Y., 6 Sept. 1853. Since 1883 she has been an assistant editor of the Boston Pilot. Her published books include: 'On the Sunrise Slope' (verse); 'Watchwords from John Boyle O'Reilly' (edited); 'A Dream of Lilies' (verse); 'A Lady and her Letters'; 'Making Friends and Keeping Them'; 'Questions of Honor in the Christian Life'; 'Bettering Ourselves'; 'New Footsteps in Forbidden Ways' (travel sketches); 'Other Ways,' a novel; 'Lalor's Maples,' a novel, with Mrs. Erskine Clement; 'Christian Symbols and Stories of the Saints' (1886).

Conway, Moncure Daniel, American clergyman and author: b. Stafford County, Va., 17 March 1832. He was graduated at Dickinson College in 1849, entered the Methodist ministry in 1850, and later studied at the Harvard Divinity School. He held Unitarian pastorates in Washington, D. C., and Cincinnati. From 1863 to 1884 he was minister at South Place Chapel, in London, England, and again, 1892–7. His published books include: 'Tracts for To-day' (1857); 'The Rejected Stone' (1861); 'The Golden Hour' (1862); 'Testimonies Concerning Slavery' (1864); 'The Earthward Pilgrimage' (1870); 'Sacred Anthology' (edited) (1872); 'Idols and Ideals' (1874); 'Travels in South Kensington' (1875); 'Demonology and Devil Lore' (1879); 'The Wandering Jew' (1880); 'Thomas Carlyle' (1881); 'Emerson at Home and Abroad' (1882); 'George Washington and Mount Vernon'; 'Omitted Chapters of History Disclosed in the Life of Edmond Randolph' (1887); 'Pine and Palm,' a novel (1887); 'Life of Nathaniel Hawthorne' (1890); 'Prisms of Air,' a novel (1891); 'Life of Thomas Paine' (1892); 'Barons of the Potomac and the Rappahannock' (1892); 'Centenary History of South Place Chapel' (1893); 'Solomon and

Solomonic Literature' (1899); 'Autobiography' (1904). He edited the 'Works of Thomas Paine' (1893–6).

Conway, Thomas, general in American service: b. Ireland 27 Feb. 1733; d. about 1800. He was educated in France, and entering the army there became a colonel. He came to America in 1777 and offering his services to the Continental Congress was appointed brigadier-general, and subsequently inspector-general, with the rank of major-general. He intrigued against Washington to have Washington superseded by Gen. Gates, and he and his associates were known as "Conway's Cabal." He resigned in 1778, went to France, and was made governor of Pondicherry.

Conway, Sir **William Martin,** English explorer and mountain climber: b. Rochester, Eng., 1856. He was educated at Trinity College, Cambridge; was university extension lecturer 1882–5; professor of art at University College, Liverpool, 1885–8; and since 1901 has been Slade professor of fine arts at Cambridge. In 1892 he traveled extensively in the Himalayas, and in the Alps in 1894; he explored the interior of Spitzbergen 1896–7, and the Bolivian Andes in 1898, as well as the glaciers of Tierra del Fuego. Among the high peaks he has ascended are one in the Himalayas of 23,000 feet, and Aconcagua, Illimani, and Sorata in the Andes. He was knighted in 1895 and received a gold medal for mountain surveys at the Paris Exhibition in 1900. He has published: 'Woodcutters of the Netherlands in the 15th Century' (1884); 'Gallery of Art of the Liverpool Royal Institution' (1885); 'The Artistic Development of Reynolds and Gainsborough' (1886); 'Early Flemish Artists' (1887); 'Literary Remains of Albrecht Dürer' (1889); 'Dawn of Art in the Ancient World' (1891); 'Climbers' Guide Books to the Pennine and Lepontine Alps,' etc. (1890); 'Climbing and Exploration in the Kara-Koram-Himalayas' (1894); 'The Alps from End to End' (1895); 'The First Crossing of Spitzbergen' (1897); 'With Ski and Sledge over Arctic Glaciers' (1898); 'The Bolivian Andes' (1901); 'The Domain of Art' (1902); 'The First Italian Renaissance' (1902); 'Aconcagua and Tierra del Fuego' (1902).

Conway, Ark., county-seat of Faulkner County, on the St. Louis, Iron Mountain & Southern R.R., about seven miles east of the bend of the Arkansas River at Sevier, and 25 miles northeast of Little Rock in an air line. The town has an extensive trade in cotton, lumber, and flour. It is lighted by electricity, and governed by a mayor and council. The educational advantages are among the best of any of the agricultural towns of the State. The Methodist Episcopal Church South maintains Hendrix College, established in 1884. The town was founded in 1871. Pop. (1900) 2,003.

Conway, N. H., a town in Carroll County, famous for the beauty of its natural scenery, which makes its villages among the most popular summer resorts in the White Mountain region. The town lies along the Saco River, on the Boston & Maine R.R., about 75 miles north by west of Portsmouth. There are extensive granite quarries in the town, and a few lumber mills. Pop. (1900) 3,154.

Con'way, Conwy, or **Aberconwy,** Wales, a town and parliamentary borough of the county of Carnarvon, about 13 miles east-northeast of Bangor. It is picturesquely situated on the left bank of the Conway River, and is surrounded by an old wall still in good preservation, 12 feet thick, and fortified with towers and battlements. The old castle of Conway, erected toward the end of the 13th century by Edward I., is one of the most magnificent structures of the kind in England. Many parts of it are still entire, including the state hall, which is 130 feet long, 32 broad, and 20 high. A suspension bridge was thrown over the river in 1826, and in 1848 another bridge was built by Robert Stephenson for the accommodation of the Chester & Holyhead Railway. It is a wrought-iron tubular bridge on the same principle as the Britannia bridge over the Menai Strait. Conway unites with Carnarvon, Bangor, Criccieth, Nevin, and Pwllheli in returning one member to Parliament. Pop. about 5,000.

Conway, a river of Wales, rising from two head-streams, one in the southeast of the county of Carnarvon, and the other in the southwest of the county of Denbigh, which unite about 15 miles south of Conway. The united stream flows north, separates Carnarvon from Denbighshire, and falls into Beaumaris Bay after a course of from 25 to 30 miles. It is navigable to Llanrwst, or about 10 miles from its mouth.

Con'way Cabal', 1777–8, in American history: an intrigue headed by Horatio Gates, Charles Lee, Thomas Mifflin (then quartermaster-general), and James Lovell of Boston (Gates' confidant, and an unsparing contemner of Washington); with Thomas Conway as a tool. The prime object was to displace Washington by Gates; and there were plenty of other ambitions which hoped to reap advancement in the overturn. It gained its momentum from that popular clamor for immediate success in a war, which settles into patience and fair judgment as the war proceeds, but rarely before cruel and irremediable wreck has been made of the repute of capable officers. Washington's magnificent use of his slender resources, against superior force, obstructionism, and treachery, was not appreciated; Gates, wrongfully accredited with the laurels of Saratoga, was the hero of the moment, believed to be capable of restoring good fortune; and much better men than the above — the Adamses, Dr. Rush of Philadelphia, etc.— were anxious to have him placed at the head of the army. In November 1777 the Board of War was reconstituted: Gates was made president, with liberty to serve in the field at will — that is, put over Washington's head with power to supersede him; and shortly afterward Conway was made inspector-general, an indefinite position with limitless facilities for spite. Washington had previously opposed his promotion to major-general, on the confidentially expressed ground that he was an empty braggart and tireless beggar; and the angry and disappointed Conway, all impulse and vanity, joined the "cabal" so hotly that it was known by his name. His appointment was meant by the head conspirators as an open snub to Washington, in hope of forcing him to resign at once, or by Conway's power of insult and annoyance. Lovell denounced Washington without stint; anonymous letters were circulated, disparaging him and exalting Gates. Finally Conway sent Gates a letter with a pungent epigrammatic sentence

vilifying Washington; Gates showed it to his aide, James Wilkinson, whose career lacks no incidents but creditable ones; Wilkinson while mellow repeated it to a staff officer of Lord Stirling whom he met on business; Stirling was told of it, and at once warned Washington what his brother officers were writing about him. Washington wrote to Conway that he had been told of the sentence in a letter of his to Gates; Conway was alarmed and let Mifflin know it; Mifflin wrote to Gates that a copy of one of Conway's letters to him must have fallen into Washington's hands, and he ought to be more careful. Gates jumped to the conclusion that Alexander Hamilton, Washington's adjutant, must have rummaged his papers on a visit to his camp in the North; and at once wrote to Washington that some of his letters must have been privately copied, and unprincipled scamps like this should be ferreted out for fear they might betray secrets to the enemy, and that he had sent a copy of Washington's note to Congress — the aim being to discredit Washington as keeping spies to pry into other men's correspondence. Washington saw through the game, and told Gates so plainly enough. He explained precisely where his information came from; adding that he had told no one but Conway, to let him know he was watched, and Lafayette, not wishing to give the British hopes through discords in the army. Gates wrote again, denying that he had ever received more than one letter from Conway, or that even that contained the sentence quoted, and declared Wilkinson's assertion a libel. Unfortunately his second letter was belied by his first, and Washington briefly wrote as much. Then Wilkinson, who had been made secretary to the Board of War, challenged Gates, who denied that he had ever said any ill of him; Wilkinson was calmed till he afterward saw the letter in which Gates had given him the lie, when he wrote a furious letter to Congress against Gates and resigned his place. By this time the whole plot was blown abroad, and had begun to disgust the public with the meanness and trickery of it all, and with the members. Then Gates undertook to send Lafayette on a senseless expedition to Canada, promising him abundant men and supplies; and so utterly failed of providing either, and the scheme was so disapproved by the public, that it pricked the Gates bubble. Conway resigned conditionally, and to his misery and despair was taken unconditionally; Gates and Mifflin were removed from the Board of War, and Gates was assigned to the forts on the Hudson, with emphatic warning to report to Washington. The adherents or helpers of the cabal disclaimed all connection with it, and Conway shortly went to France.

Conwell, Russell Herman, American Baptist clergyman: b. Worthington, Mass., 15 Feb. 1842. He studied law at the Yale and Albany law schools, and was an officer in the Federal army in the Civil War. He was immigration agent of Minnesota in Germany 1867–8; foreign correspondent of the New York *Tribune* and Boston *Traveler* 1868–70; and practised law in Boston 1870–9. He was ordained in the Baptist ministry in 1879; was pastor of Grace Baptist Church, Philadelphia, 1881–91; founded Temple College in 1888; and has been pastor of the Philadelphia Baptist Temple since 1891. He has published: 'Why the Chinese Emigrate'; 'Woman and the Law'; 'Life of C. H. Spurgeon'; 'Acres of Diamonds'; 'Present Successful Opportunities'; 'Lives of the Presidents,' etc.

Co'ny, or **Co'ney,** an old name for the rabbit; used also in the English version of the Bible as a translation of a Hebrew word probably meaning the *Hyrax syriacus*, a rabbit-like animal common in Syria and Palestine, inhabiting clefts of rocks.

Conybeare, kŭn'ĭ-bēr, John, English prelate: b. Pinhoe, near Exeter, 31 Jan. 1692; d. Bath 13 July 1755. He studied at Exeter College, Oxford, received orders, and was curate at Fetcham in 1717. He returned to Oxford in 1718, became successively tutor in his own college, preacher to his majesty at Whitehall, rector of St. Clement's, Oxford, and in 1730 master of Exeter College. In 1732 he published his celebrated 'Defense of Revealed Religion,' in answer to Tindal's 'Christianity as Old as the Creation.' In that year also he was appointed dean of Christchurch; and in 1750 succeeded Butler as bishop of Bristol.

Conybeare, John Josias, English clergyman and scientist: b. London June 1779; d. Blackheath, Kent, 10 June 1824. He was grandson of John Conybeare (q.v.), and was educated at Oxford, becoming professor of Anglo-Saxon there in 1807, and of poetry in 1812. He was also vicar of Batheaston, Somerset. He published scientific papers on geology and chemistry, but is remembered chiefly for his 'Illustrations of Anglo-Saxon Poetry.'

Conybeare, William Daniel, English geologist and clergyman: b. London 7 June 1787; d. Itchenstoke, Hampshire, 12 Aug. 1857. He was a brother of J. J. Conybeare (q.v.), and became dean of Llandaff in 1844. He published various geological papers and was eminent among the geologists of his day.

Conybeare, William John, English clergyman: b. England 1 Aug. 1815; d. Weybridge, Surrey, 1857. He published 'Perversion,' a religious novel (1856); and 'Essays Ecclesiastical and Social,' but is principally known for his joint authorship with Dean Howson of the popular 'The Life and Epistles of Saint Paul' (1851).

Cooch Behar, kooch bā-här', or **Kuch-Behar,** India, a native state and in political relation with the government of Bengal. It forms a level plain of triangular shape, intersected by numerous rivers, and is entirely surrounded by British territory. The greater portion of the soil is fertile and well-cultivated. The chief town, Cooch Behar, contains some handsome public buildings and a splendid new palace of the Maharajah, and has a population of 9,535. Area of state 1,307 square miles. Pop. 600,000.

Coo'dies, The, in the political history of the United States, a nickname applied to those members of the Federalist party in New York who favored the War of 1812. It was adopted from the fictitious name, Abimaleeh Coody, assumed by the leader of the faction, Gulian C. Verplanck (q.v.) when writing in the public prints.

Cook, Albert John, American naturalist: b. Owosso, Mich., 3 Aug. 1842. He graduated at Michigan Agricultural College 1862, and

was professor of zoology and entomology there 1869–93, when he became professor of zoology in Pomona College, Claremont, California. He was one of the first to make kerosene emulsion (1877), and to advocate and demonstrate the use of the arsenites as a specific against the codling moth (1880). He has published: 'Injurious Insects of Michigan' (1873); 'Manual of the Apiary' (1876; 14th ed. 1886); 'Silo and Silage'; 'Maple Sugar and the Sugar Bush.'

Cook, Albert Stanburrough, American educator: b. Montville, N. J., 6 March 1853. He graduated at Rutgers College 1872, and studied at Göttingen and Leipsic 1877–8, London and Jena 1881–2. He was professor of English in the University of California 1882–9, when he became professor of the same in Yale University. He is best known as an Anglo-Saxon scholar, and as an indefatigable editor of Anglo-Saxon and English literature texts and collections for use in high schools and colleges. His chief publications are: 'Siever's Old English Grammar' (translated) (1885); 'The Phonological Investigation of Old English' (1888); 'First Book in Old English' (1894); 'Glossary of the Old Northumbrian Gospels' (1894); 'Biblical Quotations in Old English Prose Writers. Part I.' (1898); a striking presidential address before the Modern Language Association in 1898; 'The Province of English Philology,' and with C. B. Tinker, 'Select Translations from Old English Poetry' (1902).

Cook, Charles, English Wesleyan clergyman: b. London 31 May 1787; d. Lausanne, Switzerland, 21 Feb. 1858. He entered the Wesleyan ministry in 1817. He traveled extensively in France and on account of his long continued evangelistic labors there is considered the founder of Methodism in France. See 'Life,' by J. P. Cook (1862).

Cook, Clarence Chatham, American journalist and art critic: b. Dorchester, Mass., 8 Sept. 1828; d. Fishkill, N. Y., 2 June 1900. He contributed to the New York *Tribune*, a series of articles on American art 1863–9; and subsequently was its Paris correspondent. He was editor of the 'Studio' until its suspension. He published: 'The Central Park' (1868); 'The House Beautiful' (1878); 'Stools and Candlesticks,' 'Essays on Beds and Tables,' and edited with notes a translation of the 7th German edition of Wilhelm's Lübke's 'History of Art' (1878).

Cook, Edward Dutton, English novelist and dramatic critic: b. London 30 Jan. 1820; d. there 11 Sept. 1883. He was dramatic critic to the *Pall Mall Gazette*, and the London *World*. His novels include: 'Paul Foster's Daughter' (1861); 'The Trials of the Tredgolds' (1864); 'Hobson's Choice' (1866). Other works by him are: 'Art in England' (1869); 'Hours with the Players' (1870); 'Nights of the Play' (1883).

Cook, Edward Tyas, English journalist: b. Brighton, Sussex, 12 May 1857. He was educated at Winchester College, and New College, Oxford, and was subsequently on the editorial staffs of the *Pall Mall Gazette* 1890–2; 'Westminster Gazette' 1893–6; and the London *Daily News* 1896–1901. He has published: 'Popular Handbook to the National Gallery'; 'Studies in Ruskin'; 'Popular Handbook to the Tate Gallery'; 'The Rights and the Wrongs of the Transvaal War' (1901).

Cook, Eliza, English writer of verse: b. Southwark 1818; d. Wimbledon, Surrey, 24 Sept. 1889. She began at an early age to contribute articles to various periodicals, and her first volume of verse, which appeared in 1840, was very successful. In 1849 she published 'Eliza Cook's Journal,' which appeared weekly until 1854. She published 'New Echoes, and other Poems' (1864), and in the same year received a pension from the Civil List. By their simplicity of theme and treatment her poems obtained a large measure of popularity in England and America. Her most familiar poem is 'The Old Arm Chair.'

Cook, Francis Ames, American naval officer: b. Northampton, Mass., 10 May 1843. He graduated at Annapolis 1863, and served for two years with Farragut in the West Gulf squadron. He became lieutenant-commander 1868; commander 1881, and captain in 1896. During the Spanish-American war he commanded the Brooklyn, the flagship of Commodore Schley's flying squadron, which took so conspicuous a part in the battle of Santiago, July 1898, when Cervera's fleet was destroyed.

Cook, Frederick Albert, American physician and explorer: b. Callicoon Depot, Sullivan County, N. Y., 10 June 1865. He graduated at New York University 1890. He was surgeon of the Peary Arctic expedition 1891–2, and of the Belgium Antarctic expedition 1897–9. He has received the decoration of the Order of Leopold, the gold medal of the Belgian Royal Society, and the silver medal of the Belgian Royal Geographical Society. He has written articles for the leading magazines, describing life in the polar regions, and a valuable account of his Antarctic experiences and scientific observations, entitled 'Through the First Antarctic Night' (1900).

Cook, George Hammell, American geologist: b. Hanover, N. J., 5 Jan. 1818; d. New Brunswick, N. J., 22 Sept. 1889. He graduated at Rensselaer Polytechnic Institute, Troy, N. Y., 1839, was senior professor there 1842–6, when he went to Rutgers College, remaining there until his death. At different periods of his service he taught chemistry, natural history, geology, and agriculture. In 1864 he was elected vice-president of the college, and appointed State geologist the same year. In 1880 he was made director of the New Jersey agricultural experiment station. His writings consist chiefly of special contributions to scientific journals, his annual reports as State geologist, and a 'Geology of New Jersey,' published by that State in 1868.

Cook, James, English navigator: b. Marton, North Riding of Yorkshire, 27 Oct. 1728; d. Hawaii 14 Feb. 1779. After a meagre education he was apprenticed to a shop-keeper at Snaith, a small town on the sea-coast. Here he acquired a taste for the occupation of a sailor, and at the commencement of the French war in 1755 entered the royal navy. In 1759 he was made master of the Mercury, which belonged to the squadron sent against Quebec, and performed the hazardous service of taking soundings in the river St. Lawrence opposite the French encampment. He also made a chart of the river St. Lawrence below Quebec in a very satisfactory manner.

In 1768 he was appointed to the command of a vessel destined to convey to the Pacific Ocean persons employed by government to make observations on the transit of Venus. The transit of Venus, 3 June 1769, was advantageously observed at Otaheite; the neighboring islands were explored, and Cook then sailed for New Zealand. Six months were employed in examining the shores of the islands: after which he took his departure for Australia, the eastern coast of which he attentively surveyed. On his return he was raised to the rank of master and commander in the navy. An account of the voyage, drawn up by Dr. Hawkesworth, was speedily published, and a second expedition was planned to explore the Antarctic regions.

On this occasion two ships were employed — the Resolution, of which Capt. Cook had the command, and the Adventure, under Capt. Furneaux. After proceeding as far south as the latitude of 71°, where a barrier of ice opposed any further progress, discovering the island of New Georgia in lat. 54° S., and visiting Otaheite and other places, Capt. Cook returned to Great Britain in 1775. The captain having communicated to the Royal Society a paper describing the regulations and remedies which he had adopted, he was chosen a Fellow of that body, and his experiments were rewarded by the Copleian gold medal. Government rewarded him with the rank of post-captain in the navy, and the appointment of captain in Greenwich Hospital. The narrative of this voyage was drawn up by Capt. Cook himself, and was published at London in 1777.

In July 1776 he sailed on an expedition to ascertain whether any communication existed between the Atlantic and Pacific oceans in the Arctic regions. In this voyage he again commanded the Resolution, which was accompanied by the Discovery, and explored a considerable extent of the western coast of North America. He also discovered the Sandwich Islands, and to Hawaii, one of this group, he returned from his American survey to pass the winter of 1778. In February Capt. Cook sailed for Kamchatka, but was compelled by an accident to put back to Hawaii. A boat having been stolen by one of the islanders, the captain went on shore to seize the king of Hawaii, and keep him as a hostage till the boat was restored. The people, however, were not disposed to submit to this insult; their resistance brought on hostilities, and in attempting to reach his boat Capt. Cook and some of his attendants became victims to the fury of the irritated islanders. A complete account of this third voyage appeared in 1784. The first two volumes were by Capt. Cook himself, and the third by Capt. James King. A medal in commemoration of him was struck by order of the Royal Society; his eulogy was pronounced in the Florentine Academy, and was made a prize subject by one of the French scientific societies. Consult Kippis, 'Life of Captain James Cook' (1788); Besant, 'Captain Cook' (1890); Wharton, 'Captain Cook's Journal During His First Voyage Round the World' (1897); Synge, 'Captain Cook's Voyages Round the World' (1897).

Cook, Joel, American journalist: b. Philadelphia, Pa., 20 March 1842. He was admitted to the Philadelphia bar 1863, but adopted journalism as a profession. He was a war correspondent with the Army of the Potomac, 1862–3, went on the editorial staff of the Philadelphia *Public Ledger* 1865, and has been its financial editor since 1883. He is also president of the City National Bank in Philadelphia. He has published: 'The Siege of Richmond, May-June 1862' (1862); 'A Holiday Tour in Europe' (1879); 'An Eastern Tour at Home'; 'Brief Summer Rambles near Philadelphia' (1881); 'England, Picturesque and Descriptive' (1882); 'America, Picturesque and Descriptive' (1900).

Cook, Joseph, American lecturer and author: b. Ticonderoga, N. Y., 26 Jan. 1838; d. there 24 June 1901. He was graduated at Harvard and Andover, and after three years' preaching went to Europe in 1871, where he studied in Germany, and made a tour of the Mediterranean countries. In 1873 he began a series of "Monday Lectures" in Boston, which, endeavoring to harmonize science and religion, and discussing social and political questions, became very popular; and in 1880 began an extended lecturing tour around the world. Besides his lectures, he published a number of works on such subjects as 'Biology' (1877); 'Transcendentalism' (1877); 'Marriage' (1878); 'Heredity' (1879); 'Labor' (1880); 'Socialism' (1880); 'Occident' (1884); 'Orient' (1886).

Cook, Mabel Collins, English novelist: b. Guernsey 1851. She was the oldest child of Mortimer Collins (q.v.), the novelist, and was married to Keningale Cook in 1871. Her writings, which include works on theosophy as well as novels, comprise: 'The Star Sapphire'; 'The Prettiest Woman in Warsaw'; 'Blossom and Fruit'; 'A Debt of Honor'; 'Vivian Romance'; 'The Story of the Year'; 'Light on the Path'; 'The Idyll of the White Lotus'; 'Through the Gates of Gold.'

Cook, Theodore Andrea, English journalist and author: b. Exmouth, Devonshire, 28 May 1867. He was educated at Wadham College, Oxford, and was on the editorial staff of the 'Saint James's Gazette' 1897–1900. He has published: 'Old Touraine'; 'Rouen' in 'Mediæval Towns Series'; 'Tobogganning at Saint Moritz'; 'A History of the English Turf'; 'An Anthology of Humorous Verse'; 'The Spiral in Nature and Art.'

Cook, Thomas, English excursionist: b. Melbourne, Derbyshire, 22 Nov. 1808; d. 19 July 1892. In the earlier portion of his career he was prominently identified with the temperance cause, but becoming convinced that traveling habits on the part of persons in general might be induced by energetic efforts to that end, he began 5 July 1841 by running an excursion train between Leicester and Loughborough on the Midland Railway, England. This was the first publicly advertised excursion train in England. From this small beginning the enormous business of Thomas Cook & Son, Managers of Tours and Excursions (known as "Cook's Excursions") was subsequently evolved. To John Mason Cook, son of the founder (b. January 1834; d. 4 March 1899), the present scope of the business is mainly due. The existing firm is composed of the three grandsons of the founder. To such an extent has the "Cook's Excursion" business developed that the company now has agencies all over the globe, the head office for the United States being in New York.

Cook, William Wilson, American lawyer: b. Hillsdale, Mich., 16 April 1858. He graduated at the University of Michigan 1880, and from its law department in 1882. He is general counsel for the Postal Telegraph Cable Company, and the Commercial Cable Company. He has written: 'Treatise on the Law of Stock and Stockholders as Applicable to Railroad, Banking, Insurance, etc., Corporations' (1887); 'Trusts: their Character, Legality, and Mode of Organization' (2d ed. 1888).

Cook Islands, or **Hervey Archipelago,** in the Pacific, situated near lat. 20° S. and lon. 158° W. The largest islands of the group are Raratonga, Atiou, Mangaia; Raratonga, the largest, has an area of about 32 square miles. The lack of water is in part overcome by the natives using the milk of the cocoa-palm as a substitute. The trade is chiefly with New Zealand; but few products are exported, although coffee, oranges, copra, and other tropical productions flourish. The islands were named after Capt. James Cook, who discovered them in 1773 (see Cook, James). The natives, nearly all of whom are Polynesians, are now Christians. Great Britain took possession in 1888; in 1900 the islands were affiliated in government with New Zealand. Raratonga has a population of about 6,000, the whole group has about 100,000.

Cook, Mount, the highest peak of Australasia; is one of the southern Alps near the centre of the range, on the west side of the South Island of New Zealand. It is 12,349 feet high, is covered with perpetual snow (the snow-line being 3,500 feet lower than in Switzerland) is difficult of access, and was scaled for the first time by the Rev. W. S. Green on 2 March 1882.

Cooke, George Frederick, English actor: b. Westminster 17 April 1756; d. New York 26 Feb. 1811. He made his first public appearance at Brentford in 1776; and in the period between 1784 and 1800 became very popular in the English provinces and in Ireland, attaining a front rank in his profession. From 1801 to 1810 he played at Covent Garden both in comedy and in tragedy, and rivaled Kemble in the public favor. His best characters were Richard, Shylock, Iago, Sir Giles Overreach, and Sir Pertinax MacSycophant. In 1810 he visited the United States and appeared before enthusiastic audiences in the chief cities. A monument marks his grave in St. Paul's churchyard in New York city, erected in 1821 by Edmund Kean, who regarded Cooke as the greatest of actors.

Cooke, George Willis, American Unitarian clergyman and author: b. Comstock, Mich., 23 April 1848. He was educated at Olivet College, Michigan, studied for the Unitarian ministry at Meadville Theological School, and was ordained in 1872. He has since held Unitarian pastorates in Wisconsin, Michigan, Indiana, and Massachusetts. He has published 'Ralph Waldo Emerson, his Life and Writings' (1881); 'Life of George Eliot' (1883); 'Poets and Problems'; 'The Clapboard Trees Parish, Dedham: a History' (1887); 'A Guide Book to the Poetic and Dramatic Works of Robert Browning' (1891); 'The Spiritual Life' (1893); 'Biography of John Sullivan Dwight' (1898); 'History of Unitarianism in America' (1903).

Cooke, Jay, American capitalist, known as the "Financier of the Rebellion": b. Sandusky, Ohio, 10 Aug. 1821; d. Ogontz, Pa., 16 Feb. 1905. He was educated in private schools, and even as a schoolboy was remarkably proficient in algebra and the higher mathematics. At the age of 13 he had entered mercantile life as a clerk in a Sandusky store, there displaying unusual ability as a bookkeeper. In 1835 he went to Saint Louis to engage in mercantile business. In 1838 he entered the banking house of E. W. Clark & Company in Philadelphia, and so rapidly mastered the intricacies of finance that before he became of age he was given power of attorney for the firm. Upon his retirement from that firm he was engaged in a general banking business until 1861, when he united with his brother-in-law under the name of Jay Cooke & Company. From 1861–5 his house acted as agent for the government in floating the Civil War bond issues to the extent of $2,500,000,000, including the 5–20 loan of $515,000,000 (February 1862), the 10–40 loan of $200,000,000 (March 1864), the 7–30 loan of $829,902,500 (June 1864 to March 1865), and others. These services he rendered to the nation for so small a commission there was practically no profit. A long period of successful operations followed the war, and then the firm became fiscal agents of the Northern Pacific Railway Company, advancing large sums of money on its bonds, but in the financial panic of 1873, being unable to realize a sufficient amount on the bonds to tide them over the trouble, on 18 September suspended business and eventually went into bankruptcy. The value of the bonds afterward greatly increased. Mr. Cooke not only regained his fortune, but paid his creditors both principal and interest. Mr. Cooke was also largely interested in Western lands and securities.

Cooke, John Esten, American novelist: b. Winchester, Va., 3 Nov. 1830; d. near Boyce, Va., 27 Sept. 1886. He published: 'The Virginia Comedians' (1854); 'Leather Stocking and Silk' (1854); 'Hilt to Hilt' (1869); 'Life of General Robert E. Lee' (1871); 'Virginia, a History of the People'; 'My Lady Pokahontas' (1885); etc.

Cooke, John Hunt, English Baptist clergyman: b. London 4 June 1828. He was educated at Stepney College and after entering the Baptist ministry held pastorates at Clerkenwell, Southsea, and Richmond. He was 20 years editor of 'The Freeman' and the 'Baptist Visitor.' He has published: 'The Preacher's Pilgrimage: a Study of Ecclesiastes'; 'A Grammar of Harmony'; 'The Work of the Holy Spirit'; 'A History of Baptism'; etc.

Cooke, Philip Pendleton, American writer: b. Martinsburg, Va., 26 Oct. 1816; d. 20 Jan. 1850. He graduated at Princeton in 1834, and began the practice of law before he was 21. He devoted himself chiefly to literature and hunting, becoming a popular writer of lyric verse. He was a frequent contributor to the 'Southern Literary Messenger' and his story, 'The Chevalier Merlin,' was appearing in it at the time of his death. Of his poems the best known are: 'Florence Vane,' which has frequently been set to music, and 'Rosa Lee'; and of his short stories, 'The Crime of Andrew Blair,' and 'The Gregories of Hackwood.' His sole pub-

lication in book form was 'Troissart Ballads, and Other Poems' (1847).

Cooke, Philip Saint George, American military officer: b. near Leesburg, Va., 13 June 1809; d. Detroit, Mich., 20 March 1895. He was graduated at West Point in 1827 and rose to the rank of brigadier-general. In the Mexican war he commanded a regiment in the city of Mexico, and in the Civil War sided with the Union and greatly distinguished himself in the Peninsular campaign. He was the author of works on tactics, and of 'Scenes and Adventures in the Army': 'Conquest of New Mexico and California' (1878).

Cooke, Rose (Terry), American poet and story writer: b. West Hartford, Conn., 17 Feb. 1827; d. Pittsfield, Mass., 18 July 1892. She married Rollin H. Cooke in 1873. Her complete poems were published in 1888, 'The Two Villages' being her best-known poem. Her short stories treat of New England rural life, her most acceptable work appearing originally in the 'Atlantic Monthly' and other periodicals. Her published books include: 'Poems' (1860); 'Happy Dodd' (1878); 'Somebody's Neighbors' (1881); 'The Sphinx's Children and Other People's' (1886); 'Complete Poems' (1888); 'Steadfast,' a novel (1889); 'Huckleberries,' a collection of short stories (1891).

Cooke, Sir William Fothergill, English electrician: b. Ealing, Middlesex, 1806; d. 25 June 1879. He served in the Indian army from 1826 to 1831; and, after studying medicine at Paris and Heidelberg, abandoned this for telegraphy, and in 1837 entered into partnership with Prof. Wheatstone. After experiments on various railway lines, they patented the single needle apparatus in 1845. In 1846 Cooke formed a company, which paid $600,000 for the partners' earlier patents. In 1867 Cooke and Wheatstone received the Albert gold medal; Wheatstone was knighted in 1868, and Cooke in 1869.

Cookery, the art of preparing food for eating. The savage does little or no cooking; he lives on roots, fruits, insects, and raw flesh, and when he cannot procure food, he twists his belt tighter and tighter; the barbarian makes a fire and hunts and fishes, but still eats much of his food raw, or with the slight disintegration of fibre given it by the motion of his body as he carries the food on his steed. Neither cares for variety, nor has any purpose in eating other than to satisfy hunger. With the development of agriculture, came an increase in food supplies, in the use of fire in cooking, and an advance in civilization; and with the development in man's social nature, eating ceased to be a mere grabbing game, and food was shared with friends,—and strangers also, for there were no public inns,—as an evidence of good will. Later, feasting was a part of all hospitality, and banquets in honor of the gods, of victory, or some special event, came to be considered the highest form of social physical enjoyment. As the ancients in times of prosperity sought the rarest foods (500 nightingales' tongues were often made into one pie), and served them in the most costly manner (whole cities being ruined, it is said, where Xerxes was entertained for two meals), so history repeats itself, and some modern hosts spare no labor or expense in setting before their guests the most unique concoction their chef can prepare, as the highest expression of good will. But they often have no concern as to the nutritive effect of their offering. The thoughtful person feels that extravagant cooking and riotous feasting are not necessary to true hospitality, nor to the genuine enjoyment of food. He has learned that the true reasons for cooking food are:

First, to have the time and energy needed to digest and assimilate unprepared food, to use in getting a living and developing his mental and moral nature.

Second, to facilitate mastication and digestion, by softening hard and tough substances, changing starch into dextrin, sugar into caramel, and connective tissue into gelatin, developing improved flavors and odors, and having at least a part of the food warm.

Third, to destroy parasites and disease germs.

Fourth, to keep foods which are perishable that he may enjoy them when out of season.

The cooking of food includes several important processes, not always considered, some of which call for the highest degree of intelligence; but too often cooking is regarded merely as a form of manual labor. Taking these in their natural order we have:

Selection.— This was once a question of mere environment; food nearest at hand being the "Hobson's choice" of the savage, as it now is of the very poor in many lands. Climate and non-intercourse with other nations limit choice, as invasion, travel, and increased trading facilities extend it. From the limited, but not always scanty fare of the Pilgrims, to the cosmopolitan markets of the present day, is a wonderful advance, and the modern American often yields unwisely to their temptations. Appetite guides us safely in this choice of material, when it has not been impaired by too great indulgence in improper food. To select from this vast supply, food sound in texture, free from adulteration, seasonable, not exorbitant in price, adapted to individual need, and suitable in quantity, needs no small amount of judgment in the buyer, who often must also be the cook.

Separation.— The removal of the inedible from the edible portions of food is important, for the thoroughness with which it is done, has much to do with making food palatable. Perhaps in no other part of the work has there been greater improvement over the primitive methods, as man's idea of what is inedible takes him farther and farther away from the savage, some of whose methods are too repulsive to bear allusion. Our forebears were entertained before the feast by the slaughtering of animals in their presence, but now the refined taste is offended by the sight of a fowl dressed for the table in his discarded feathers; or a bit of hull in a supposed-to-be coreless apple, or food served in inedible scooped-out skins.

Combination.— The union of various materials often produces a more palatable food than any one would give alone. Association, custom, and appetite have much to do with deciding whether certain combinations are harmonious or otherwise. Saffron, tansy, asafetida, decayed fish powder, and hosts of other strange flavorings, do not appeal to us, although highly prized by other nations. Pies,

supposed to be filled with delectable compounds, but out of which dwarfs sprang and danced, and blackbirds sang, pleased our ancestors; and surprise is still a pleasant element in cookery. But it is not pleasant to find the biscuit which was supposed to be sweet with the nutty flavor of the wheat, redolent with alkali.

Literature is replete with legends of the accidental discovery of the improved flavor found in a bit of the forbidden flesh on the altar, of fish rescued from burning seaweed, of bread made lighter with a portion of left-over dough, and of many others which led to new ways of preparing food. The most fanciful legend seems credible when we remember the many times in one's own experience when accident or necessity has led to new combinations. Scientific proportion, correct measurement, thorough mixing, and sufficient judgment to allow for the "total depravity of inanimate things" are needed to insure uniform results. So to blend materials that they will develop "what ingenious cooks the relish call" is the fundamental principle of cookery, for "all foods are tasteless till that makes them good." It is the undesirable combinations of the odors from the different foods in the ovens and kitchens of many hotels and restaurants, that makes the unsatisfied boarder long for home cooking.

The Belgians, Swiss, and Austrians are said to have best acquired the art of retaining in a high degree in each food, its full essence, aroma, and properties, so that each dish has no odor or flavor from another. It is said one of the Roman epicures had a separate cook and separate kitchen for each dish.

Too much time and thought are given to the making of new combinations merely to gratify the desire to excel one's neighbors in our luncheon. This causes great nervous strain and physical fatigue, and imposes upon the guests, a deal of unnecessary work for their digestive organs in the undoing of these combinations.

Manipulation.— For the manual part of cookery, tools and utensils are needed, which if wisely selected, will not oblige one to say with Telemachus,

> Lend me, I pray you, the sauce pans
> In which you boiled your beans.—*Timocles.*

That cook is fortunate who has the strength and endurance needed for the back-and-arm-aching parts of the work, and still more fortunate if she possesses the deftness of hand and keen sense perception of the culinary artist; for we cook by the senses of touch, smell, and hearing, as truly as by sight and taste. And those for whom she cooks are happy indeed if she knows how to apply heat (see *Methods*) in the way that food will yield the greatest amount of nutriment in the shape best fitted for the body to assimilate it, otherwise much food will be wasted in the cooking and wasted in the body.

Decoration.— This is the last step in the manual part of cookery, but an important one, for "the imagination should be fed when we feed the body, they should both sit at the same table." Those who labor with the larger muscles are usually sufficiently hungry to eat whatever is clean and wholesome; but the non-hungry person, or one who works with the small muscles of the hands or eyes, needs the stimulus which the senses of sight, smell and taste send to the stomach, to arouse his sense of hunger. This class of persons increases as civilization advances. There are some foods which if one ate them blindfolded, would satisfy the mouth and the stomach would not demur. The nose rebels at Camembert, but the mouth approves. The eye should not be pleased and the tongue offended, but all these "gate tenders of the stomach" should agree in approval, if we would derive the best effect from our food. The tendency of the modern cook to make superfluity of garnishing conceal both merit and defect in material, is to be deplored. Simplicity in design, harmonious blending of color and material, enhancing rather than disguising the individuality of each dish, with the least expenditure of money and labor, are most to be desired, and make of this indeed a fine art.

> To take some meat that some one else has bought
> And then to dress it tolerably, is
> What any cook can do.
> A perfect cook is quite another thing,
> For there are many admirable arts,
> And of all of these he must be thorough master,
> Who would excel in this. He first must have
> A smattering of painting and indeed
> Many the sciences which he must learn
> Before he's fit to think of cookery.—*Nichomachus.*

Cookery as a Science.— But little thought was given to this aspect of cookery by the ancients; probably more among the Greeks than among other nations, for the Greeks worshipped Hygeia, the goddess of health, and lived on coarse foods, barley bread, oil and wine. Wheat was called the "marrow of man" and "running, fatigue, hunger, and thirst" were their seasonings. Cookery attained a high degree of development during the Attic Age. The following quotations show that the Greeks understood the qualifications of a cook, and the effect of heat and water on food; and the third hints that our kitchen maids of to-day were not the first cooks who hurried up the fire with oil.

> His mind must comprehend all facts and circumstances;
> Where is the place and what the time for supper;
> Who are the guests and who the entertainer;
> What fish to buy and where to buy it.—*Athenæus.*

> Fish that are fat are pleasant to the palate, but heavy and difficult of digestion, therefore they are better cured or roasted, for by that process their fatty parts are got rid of. Oysters when boiled get rid of most of their saltness which they infuse into the water which boils them, and this water is apt to disorder the stomach; but roasted oysters have all their evil properties removed by the fire.—*Mnesithus.*

> Placing all my pans upon the fire, I soaked the ashes well with oil, to raise a rapid heat.—*Archedius.*

The cook held the life and honor of his master in his hands, so common was poisoning by food; honors and wealth were bestowed upon those who had ability; those from Sicily ranking highest.

It was not until chemistry had advanced to the position of an exact science, and had evolved methods of analysis for organic substances, that the nature of food constituents, the changes in the nutritive value of food brought about by cooking, and what becomes of food in the body, could be determined.

Although vast strides have been made since Count Rumford, an American, who lived in Europe the latter part of the 18th century, taught the world how to cook and was the first to note the changes in the nutritive value of food on a large scale, the insight and method of the scientist,— the science of cookery is yet in its infancy.

The Agricultural Department in Washington has done a few years along the lines of scientific analysis and experiment in food values, and its bulletins [illegible] frequently and free to all who [illegible] supply the latest and most reliable information. Investigations have also been made by many of the most civilized nations into the best way of preparing food for the army and the inmates of prisons and hospitals. Cooks gain their knowledge of the art of cookery by apprenticeship to noted chefs, taking a long and thorough training in every branch of the work. In Germany young ladies of the best families are trained in the kitchens of the nobility, and there are probably no better cooks and housekeepers in any land. Learning at the home, by "mother's way," is all the training many skilful housekeepers have received, but this, combined with judgment and tact, has produced much good work.

During the last half of the 19th century, schools for instruction in cookery were opened in England, the agricultural colleges of the West, New York, Boston, and other large cities. Here not only the art, but the scientific principles were taught, and the pupils included children from the mission schools, servants, housekeepers, young and old, college and medical students, and ladies of wealth and leisure. The first outgrowth of this beginning was the establishment of schools for the training of teachers of cookery, and later cooking was made a part of the regular course in the public schools. Boston led in this part of the work, and now at the beginning of the 20th century, there are but few States in the Union and but few European countries where cooking schools are not found in successful operation.

Literature.— Cooking and feasting have been the theme of brush and pen, of song and romance in all countries, and from the earliest days of book-making, cookery has had quite a literature of its own. The names of Archestratus, Herodotus, Homer, Apicius, Lucullus and many others, are associated in the minds of the student, with the cookery and banquets of the Greeks and Romans. To attempt to enumerate those who have helped in the development of modern Italian, French, and English cookery, would be to do injustice to many of whom limited space would prevent mention. If one were to ask for the catalogue of cookery literature in any large public library in America, it would be found to be quite a volume. So rapidly has the literature of cookery multiplied, since it has taken front rank among the arts and sciences.

It has been claimed that men are the only really good cooks, chiefly because they make it their business for life and strive to excel in the art, whereas women adopt it only as a means of support until marriage relieves them from its necessity. And Dr Johnson said that "women could not write good cook books." Perhaps men are better fitted to be chefs in hotels and large establishments, and to work with and manage a great body of men, and from having no other duties they have had ample time and means to give the subject more study. But when we recall the many women who have always prepared good, wholesome (if not fancy) food for their large families, those who have catered to hotel guests, and those who have done fine work in teaching the science of cookery in schools and by their books and lectures, we question the statement. The American cook book of the 20th century is not a mere compilation of untried and inaccurate recipes, it is not a record of only one person's experience, where much is left to judgment, nor of a style of living too extravagant for the average home; but it is an evolution from the best experience of all nations, a collection of exact formulæ deduced from actual experiment, giving the results of the latest scientific research, and all presented in an entertaining way in the best literary style.

Evolution.— The evolution of cookery as traced in food, would be something after this order: The first foods were natural; milk, wild fruits, and vegetables, flesh and fish, eggs and animal fats, honey and salt, oily seeds, and beverages made from simple fermentation of fruit-juices and of milk. The second stage might be called one of cultivated and manufactured or combined foods: the cereals, grains, and legumes were developed into bread, cakes, puddings, and malted drinks, milk into butter and cheese; intercourse with other nations brought a greater variety of vegetables, fruits, condiments, and beverages. The present stage is one of refined foods. The refinement of flour and yeast, the concentration of the sapid principle in meat and its use in soups and sauces, the refinement of fruit and vegetable juices into sugar, and its increased use in fancy cakes, pastry, desserts, and artistic confectionery, are typical of the most advanced and refined forms of cookery.

In tracing the evolution of cookery among different nations, we find it has had the customary rise and fall of all the arts; increasing in variety, magnitude, and indulgence with the growth and prosperity of each nation; its national characteristics always largely determined by climate and natural advantages, but varied by invasion, intermarriage of rulers and nobility, and the advance of civilization. Persia with her fruits, sweets, wines, and her lavish display, modified the simplicity of the Greeks; the luxury and extravagance of the Romans disappeared under the invasion of the Goths, who cared only for wild fruits, fowl, venison, horseflesh, and curdled milk. During the Middle Ages the best cooking was done in the monasteries. They had ample means and their many fast days incited them to the invention of many disguises. In Italy during the Renaissance, cookery, with the other arts, became more refined, and France soon felt the influence, through the Medici. She had early learned economy through necessity from famine and the exactions of her rulers; her many revolutions compelled every peasant to learn to make something savory of weeds, acorns, snails, rats, and other things which many nations reject. Modern French cookery dates from Louis XIV, and attained great height under his successors. The nobility and even royalty spent much time concocting new dishes, Richelieu made mayonnaise, and Bechamel, the sauce bearing his name. The French made great use of meat essence as a dressing for meats, and it was considered a great improvement over the oil of the south and the animal fats of the north. Large amounts of meat, poultry, and game were often used solely to secure a small amount of glaze with which to dress an entrée; this shows an

extravagant as well as an economical side to French cookery. Under Napoleon French influence was widely extended and it is said he left a French chef in every land he invaded. There are more chefs from France in America than from any other country. Austria and Switzerland rank next to France in excellence of home cookery. England's love for pork began with the Saxon invasion, and though condemned by some of her colonists, it is yet the main stay of her laboring classes. The coarse tastes of the Danes were modified by the soups and stews of the Normans. Many of our culinary terms are of Norman origin, and the surnames Cook and Butler came from professionals in that line. After groaning for centuries under saddles and sirloins, England's tables became more simple, for after the Reformation rich cooking was considered popish. Although modified by the modern French, England is still the great meat-eating nation. "The English do their culinary work at the table with their palate-scorching table sauces, but the French do theirs in their saucepans." Scotland with her barren hills, lacked vegetables, but mutton, game, and fish were abundant; her cock-a-leekie and haggis show the influence of France.

There are still a few distinctly American dishes, many of them borrowed from the Indians, some made from native products, but a large number are but modifications of the customs in the homes of the earliest settlers. The Yankee's love for pie may be traced to the mother country, and for the doughnut to Holland. The Dutch left a strong impress on New York and the Germans in the middle States. Extravagance in methods, great waste of fuel and material and the indigestibility of some of our national dishes, have been our defects, but a large part of genuine American cookery will compare favorably with that of other nations. Within the last half century travel and wealth have changed our tastes in a measure, enabling many to have chefs from abroad who command very high salaries. But little has been gained from that nation whose daughters were the first to whom we relegated our kitchens and our cooking, except about the cooking of our most common vegetable. We have gained far more of value from the sons of China and Japan. France has done more than any other nation in teaching us economy and artistic effect, and the influence of Spain is apparent on our western coast and our new possessions. The advantage of this influx of foreign element into our cuisine has been greatest in cities and among traveled classes. In remote country places and everywhere among native laboring communities, there is need of knowledge of some of the economical foreign methods. Cooking teachers find it wise to accept some of the suggestions from their pupils of German and Italian parentage, instead of insisting that our methods are always the best. No doubt many foreign nations would derive equal benefit and enjoyment from some of our dishes which are seldom seen there. Canvasback ducks, softshell crabs, strawberry shortcake, fish balls, pumpkin pie, prairie chicken, red-snapper, cranberries, and oysters in many ways, are eagerly welcomed by the returning traveler.

The cultivated American of colonial descent, while loyal to the virtues of succotash and the four B's of Boston, which are similar in nature and food value to the tortilla and frijoles of Mexico and the lentils of Egypt, is learning what to accept and what to reject from the solid puddings, pastry, bread, and meats, of England; the spicy cakes, sour vegetables, sausages, and delicatessen supplies of Germany; the complex soups, sauces, entrées, souffles and artistic disguises of the French; the pungent Spanish puchera; the savory Hungarian goulasch; and Turkish pilaf; the Italian polenta, risotto, and macaroni; the hors d'œuvres of Russia and Scandinavia, and the curries and fruits of the tropics; and from them all he is beginning to evolve a simplicity and an individuality which may be characterized as truly American. He prefers on his meat the sauce of its own juices, he insists on having no doubt as to the identity of his veal and chicken, he has accepted the piquancy of the green salad with its soothing oil in place of the sweets of the pudding and the sharpness of his mother's pickles. The nutty Vienna roll has taken the place of the half-baked raised biscuit, and he finds the bit of cheese which is the main food of the Swiss or Holland peasant, with the fruits and nuts of the savage, a good substitute for the soggy pie of his aristocratic ancestor.

Evolution of Methods of Cookery.— It is sufficient for our purpose here to consider foods merely as animal and vegetable, with albumen as the type of the former, and starch of the latter, albumen requiring a low and starch a high temperature. (See Foods.) Starch and albumen are frequently combined in natural food, and still more frequently in cooked food, but they must be digested by fluids of a different nature, one an alkaline and the other an acid. Therefore, how to cook them that each may best do its work in the body, is the problem of good cookery.

Heat.— Cooking means, to prepare by heat (Latin *coquo*), and in all its phases, heat is the important factor. The heat of the sun causes plant food to grow and ripen; the heat of the living animal prepares its flesh and products for the higher animal, man; he applies artificial heat in cooking vegetable and animal foods, and after eating them, his own internal heat helps in the assimilation of the food into his body. The absence of heat sufficient to be called *cold* is essential to make many foods more palatable. *Water* is removed from some foods by concentration, and added to others for the solution of albumen and the hydration of starch. *Air,* for the expansion of various substances the development of improved flavors and the dissipation of disagreeable odors is essential, and care should be taken that it be pure as possible.

Fuel.—Heat for cooking purposes was obtained first by drying foods in the sun. Many kinds of flesh, fish, and fruit are still prepared in this way. Then came the burning of wood, oil, coal, gas, coal oil, and alcohol; the latest advance is the use of electricity, the expense of which has retarded its adoption, but its merits are great and its possibilities unlimited.

Heat is applied to food in two ways: through hot air, as in broiling, roasting, and baking; and through hot liquids, as in boiling, frying, and their variations.

Broiling or *Grilling* is cooking by close contact with the fire. The primitive way was on the coals: the smoke and ashes

[illegible] the Lapidarian to wind the [illegible] round a stick and hold it over the fire much as the Turks do now with their [illegible] of mutton, or kabobs. To save personal attention the meat was suspended from a stick; later it was cooked on bars of wood or iron, called a gridiron, hence our word grilling, and was turned when partly cooked. The modern improvement of this time-honored method is the wire broiler, used over red-hot charcoal, or under the gas flame, and frequent turning has long been the secret of good broiling. Contact with the fire sears the fibres, with a crust [illegible] outside substance, but it seals the juices inside and gives the richest possible flavor. The gridiron is the thermometer of cookery. *Toasting* is simply the broiling of bread and other cooked starchy foods, in order to develop dextrin. It sometimes develops charcoal. *Panbroiling* is cooking in a very hot dry pan, with sometimes the merest film of grease to prevent too great loss of substance by adhesion. The quick searing gives almost the same flavor as in direct broiling. A convenient way for the chafing dish and oil stove.

Put the anchovies in the heated pan and in a moment they will begin to hiss and are done.—*Archestratus.*

Roasting is a modification of broiling, at a lower temperature, adapted to large pieces of meat and poultry, which, on account of their thickness, are placed at a greater distance from the fire after the first searing. In early times the animal was dressed and hung at once over the fire; when the fire was made in a hole, sticks were laid across on which the animal rested; we call it a barbecue. After fires were built on the hearthstones and cooking was done inside, the meat was hung on a frame placed in front of the fire, and was turned and basted by the cook's attendants. This was the common way of cooking meat in the great baronial halls of England for many centuries and may still be seen in old country inns. The modern spit has its clock-work attachments, which turn the meat, dip up the gravy and pour it over at regular intervals. In warm countries but little roasting is done; and although once the only way in America, it is now seldom done except in hotels, and by those who have ranges with a special attachment for roasting, or who have revived the old custom on the hearth of their country kitchens, for there are many who still think the old Greek method greatly superior to the cooking of meat in the oven, which is commonly called roasting.

Many are the ways and many the recipes
For dressing a hare, but this is best of all.
To place before a set of hungry guests
A slice of roasted meat fresh from the spit,
Hot, seasoned only with plain simple salt,
Not too much done. And do not you be vexed
At seeing blood fresh trickling from the meat,
But eat it eagerly. All other ways
Are quite superfluous, such as when cooks pour
A lot of sticky, chancy sauce upon it.—*Archestratus.*

Baking is cooking by the heat radiating from a hot oven. The principle is the same as in roasting and broiling, namely, a quick searing of the outer surface for the sake of the flavor and to retain the juices, then a lower temperature that the heat may reach the centre without burning the outside. If the oven is not hot, or water is used at first, the juices are drawn into the pan, enriching the gravy at the expense of the meat. Flesh which has tough connective tissue, cartilage and bone, should be cooked a long time, and needs the solvent action of water, after the first browning. Baking renders watery vegetables drier and more savory, develops new flavors in fruits and grains, and changes some of the sugar in the crust of cake into caramel and the starch in the outside of bread into dextrin. Some forms of baking are so nearly allied to stewing, that it is impossible to make a strict divison, but there is a great difference in the flavor developed by the two methods. In baking, the temperature is the important point, varying from 212° to 400° for different articles. The oven thermometer is the evolution of the old-time "hand and try cake" methods. Baking was done first in the hot ashes, then in a hole in the ground — the primitive oven — where a fire was built on stones and after it had burned down to coals, food was laid in, either in clay pots, or wrapped in moist leaves, then covered with brush or leaves, and left to cook slowly for a long time. Bread-fruit in the South Sea Islands is baked in this way. Pounded and moistened grains made into a thin batter were spread on hot stones by a dextrous sweep of the hand, cooking almost instantly; this was the first bread; the process may be seen now among the Arizona Indians in making piki. Some one found it better to cover the oven permapently and have an opening at one end; this was the beginning of the brick oven.

At the hearth fires, a covered utensil to stand near or over the coals, and later the Dutch oven, answered for daily use; the great brick oven near the chimney soon followed, and here enough "rye and injun" bread, pies, cookies, Indian meal pudding, and beans, were baked to last a large family through the week.

The kitchen range is an evolution of an American invention about the beginning of the 19th century. In many European countries they still use tile and brick stoves without ovens, all of the baking being done outside the home. In America there are ovens of every size and kind, from the tiny tin box for the gas burner or oil stove, the jacketed box of the Aladdin oven (see OVEN, ALADDIN), which concentrates and utilizes all the heat from an oil lamp, the ventilated ovens of the coal and gas ranges, to the immense ovens of large baking establishments, with their steam jets, revolving shelves and griddles, and other contrivances for securing the right temperature and texture.

Frying is immersion in hot fat: from 345° to 400°. This is not boiling fat, as it is often called; it is the water in the food, or the fat, if new, which bubbles. Immersion implies depth enough to cover the articles, that the surface may be hardened before the fat can penetrate the food. A coating of egg and crumbs helps a moist surface to harden quickly and keep its shape. Some previously cooked foods are fried merely for the flavor and crispness of the crust. Frying has been called the "curse of American cookery," but it is the wrong use of it, that merits condemnation. Tough meat, and flour mixtures rank with soda, put into cold lard and left to stew and sizzle until hard and soaked with burned grease, have been all too frequently a large part of the daily food on many American tables. It may have originated when it was so much of an undertaking to "fire

up" the brick oven, and the drafts prevented the food in the Dutch oven from getting beyond the palest tint of brown. But there are indications that the broiler, the Scotch bowl, and the stew pan, are taking the place of the spider. When at its best frying is not to be recommended for those with weak digestion, its only merit being its quickness, but this is gained at the expense of time in the last stage of the work, digestion. But little frying would be done if everyone had to fry his food and inhale the odors. Frying probably originated where olive-oil was in common use, and oil is still the general frying medium in countries bordering on the Mediterranean. There it is usually done well, for vegetable oil may be heated with less acrid odor than from animal fats. When a pure vegetable oil without odor can be procured at reasonable rates in America, and when housekeepers are willing to believe that it is more economical to fry in a large amount of fat at high temperature and drain the fried food thoroughly, than to let a smaller amount of fat be absorbed by the food, frying will be greatly improved. *Sautéing* is a French term meaning "to toss," or turn over. It is the common way to cook omelets, mushrooms, and other foods which need merely to be browned on each side in a little fat, or stewed in hot butter and tossed about until cooked. *Griddle Baking,* sometimes called frying, is cooking on a hot griddle, with no fat, if of soapstone, and but little if of iron. The griddle is shallow and would not hold fat. For waffles and fancy wafers the griddle is double and revolves over the fire.

Boiling and *Simmering*, terms often applied to cooking in water, regardless of temperature, so long as it is on the fire. At the sea-level, water *simmers*, or bubbles gently below the surface, at 185°, and *boils*, or bubbles all over the surface at 212°. Density, weather, and altitude vary the boiling temperature more or less, but it is easier to make some cooks understand this, than to convince them that water can not be made any hotter after it once boils all over, at least not in the ordinary kettle. The scientifically trained cook knows that "just a smile at one side of the meat" will cook it perfectly, and some of the foreign peasants seem to have known it intuitively, but the average cook in our kitchens piles on the coal until the water "dances a jig," and then wonders that her meat is stringy and tasteless. The first knows that if she wishes good broth or stock, she cuts the meat small, puts it into cold water and lets the juices soak out, then heats this water to the simmering point. But the average cook never can remember when to use hot, when to use boiling, and when to use cold water. The educated cook knows that rapid boiling is advisable for the first five or ten minutes, to seal the juices inside in boiled meat, — the thinner the meat the shorter the time — and also to cook the starch in grains and vegetables; and that after this, the water should only simmer else there will be great washing out of substance. She knows, too, that when particles of food are to be kept in motion, to prevent adhesion among themselves or to the kettle, as in cooking rice and macaroni, the rapid boiling may be continued that "the rice may dance about." But to the average mind the cooking of food in water is probably more or less guesswork, judging by the results.

Stewing is only another form of simmering. In making a soup a large amount of water is used, and in making a stew, a small amount. In both, the cooking is continued a long time at a gentle heat. Tough meats are improved in flavor by the union with vegetables, spices, and other seasonings. In the soup they are removed, if it is to be clear, but in the stew they are retained. When dumplings of biscuit dough are cooked as a cover for the stew, or shortcake is served around the stew, it becomes a *potpie.*

Fricasseeing, meaning "to fry," is a combination of frying with stewing, by which a flavor like that in frying, or pan broiling, is obtained.

The term is sometimes used when no real browning is done, the simple warming, or stewing in butter at a low temperature, making it, according to some authorities, a fricassee. It is to be regretted that the desire for new names (thinking thereby to have a new dish) has almost obliterated the true meaning of many culinary terms; there seems to be no standard for nomenclature.

Braising is a combination of frying, stewing, and baking, with vegetables, etc., formerly done in a stew-pan having a hollow cover, in which coals were put for the final browning. It is a common way in foreign lands, where ovens are not much used and fuel scanty, only a little being needed for the slow fire for stewing, and each half-burned bit carefully put out by water and laid aside for another time. Braising is now done in an earthen dish, called a casserole, and foods á-la-casserole are becoming very popular at hotels. It may be done in a granite pan with a tight cover and finished in the oven. It is one of the most savory ways of cooking meat, game, and poultry.

Smothering, or *Pot-roasting* is done by quick searing of meat in a little of its own fat, in the stew pan or pot, then adding barely enough water to prevent burning, covering closely (formerly with a lid of dough when it was done in an iron pot before the fire), and cooking slowly in the steam of its own juices. It gives rich, undiluted gravy and very tender fibre; the best way to cook tough lean meat free from bone.

Steaming.— Real steaming is done chiefly in factories, or large establishments, where the steam is confined in boilers and superheated, and then conveyed through pipes to the kettle containing the food. Owing to the expansive force of steam it cannot be confined in an ordinary kettle, and many of our canned fruits, soups, and vegetables are more successfully done there, than they could be at home. But we cook some foods over, or surrounded by boiling water, and call it steaming. In the first way, the food is placed on a perforated pan, above the water, the moist steam surrounds it, and in condensing, gives up its heat, which cooks the food. In the second way, a double or farina boiler is used (or a pail inside a common kettle), the heat is conveyed by the steam or boiling water through the metal, and thence to the food, which is less hot than the water, as the metal has absorbed some of the heat. Steaming makes tough meat tender and moist, and enables us to cook vegetables and glutinous foods without the constant attention

...cooked it covered over the fire, or in a little water. The Romans had a kind of double boiler, also the cooking dish, which is one variety, combined with a stewing pan. Our grandmothers could cook a pot of hasty pudding without stirring it, but with the advent of many more utensils and the knowledge that many foods containing milk and eggs need a low temperature, a great variety of steamers and double boilers have come into use. Our grandmothers lived in their kitchens; it was but little work to "watch the pot" while they spun or wove, and the great kettle of cider apple sauce seldom had even a hint of scorching. But the modern housewife aims to spend as little time as possible in her kitchen. When we learn to think of it as a laboratory, it may tempt (although it may not require) a longer sojourn.

Cooking in water was probably the last to be discovered of the primitive methods, for it could not have been done until water-tight utensils were made; these were first, baskets, made by plaiting grasses, twigs, and rushes; then bowl or troughs were made by burning out hollow places in a log. Stones were heated in the fire and plunged into the water in these baskets or troughs, and this cooked the food. Indians cook their acorn mush in this way, and the Alaskans use their canoes for boilers, heating the water with hot stones, when they boil the salmon for its oil. When clay was found, they learned to shape it into bowls; then into pots with three legs, and thus had a fireproof as well as water-tight utensil; and after this stewing came into general use. Jacob's savory venison was probably stewed. In spite of luxury, the old men in Greece preferred the black broth made of cuttle-fish. "Rome was raised on gruel," or pulse, made of barley and vegetables, and it is probable that stewing in some of its forms has been the method in most general use, among the masses of the people, who from limitation of means and of food supplies, have learned its value. Stewing is not advisable, as commonly done in America, where a large amount of fire must be kept in one of our immense ranges especially for this purpose, but when it can be done over just the small amount of fire or gas needed, it is undoubtedly the most economical and nutritious way of cooking the cheaper kinds of meat, fish, and poultry, and it is capable of many variations. But the average American man of moderate means does not take kindly to cheap meat. In this "land of the free and equal," he aims to have as nice a cut of steak as his rich employer, and his helpless helpmate probably knows no other way to cook meat save in the omnipresent frying pan, and has no idea of the principles of the Norwegian cooker. Americans, with the best vegetables in the world, have much to learn about the cooking of them. Too much water and too little cooking are the American faults; just enough butter or oil to prevent burning, and then a slow stewing in their own juices, saving them generally, instead of throwing them out in the water,—is the better way for many vegetables. Our beverages, our soups and steamed puddings, our candy-making, and many other foods, are palatable or otherwise, according to our knowledge of cooking in water. A letter asked by a lady in the early days of ... schools, shows the lamentable ignorance of many women on this important subject: "How shall I know when the water boils?"

It is interesting to note that every primitive method has its counterpart now, not only among the barbarous people, but we find that persons of the highest civilization and refinement, adopt some of them instinctively, when camping necessities suggest their use, or the satiated appetite craves simplicity. No foreign chef has produced anything finer than the trout cooked on a swinging birch bough before the camp door, a potato baked in hot ashes, scalded corn-meal baked on a board on the hearth, sweet corn roasted on hot stones, a planked shad, a Louisiana gumbo, a Brunswick stew, a Rhode Island clam-bake, or beans and pork baked in a bean-hole in the Maine woods.

Revolution.— Many thoughtful minds prophesy that the next step in the evolution of cookery, will be one of "revolution among the eaters themselves." Already many have revolted against meat and other animal foods, vegetarianism having made great advance in favor. Much of the laborious part of cooking has been taken from the home to the public kitchens and bakeries, or to the manufactory of prepared foods ready for the table. The overtaxed digestive organs are demanding relief, by a change to more simple living. A few persons are beginning to understand that the man of moderate means spends too large a portion of his earnings for his food; that there is great waste of labor, fuel, heat, comfort, temper, health, and morality in the cooking of food; that intemperance in eating produces as direful results as intemperance in drinking; that "a man is what he eats," and that high thinking comes easiest after plain living. See NUTRITION.

MARY J. LINCOLN.

Cook's Excursions. See COOK, THOMAS.

Cook's Voyages. The account of Captain Cook's three voyages were written by as many hands; the first by Dr. Hawkesworth; the second by Cook himself; while Lieut. King prepared the third from Cook's notes, and completed the narrative.

The first voyage was undertaken in 1768, to observe the transit of Venus. Having made successful observations at Otaheite in the Society Islands, Cook explored the South Seas, and determined the insularity of New Zealand, hitherto considered part of a great Antarctic continent. He discovered the straits named after him, and amid great dangers explored the eastern coast of Australia, hitherto unknown. In 1772 he started on a second voyage, to explore the hypothetical Antarctic continent. He investigated the specified latitudes, and sailed farther south than any previous navigator. Having satisfied himself that no such continent existed, he turned eastward and discovered New Caledonia, Georgia, and other islands. His third voyage was in search of the Northwest Passage. Sailing about in the Pacific, he discovered the Sandwich or Hawaiian Islands; and then, having explored the unknown coast of North America, he passed through Bering Strait, and surveyed the coast on both sides.

Coolbrith, Ina Donna, American librarian and poet; b. near Springfield, Ill., but while a young girl went to California, where she has

since lived. She has been librarian of the Oakland Public Library (1874), the Mercantile Library of San Francisco, and since 1899, of the Bohemian Club in the latter city. She has published: 'A Perfect Day, and Other Poems' (1881); 'Songs from the Golden Gate,' and contributions in the 'Overland Monthly.'

Cooley, LeRoy Clark, American physicist: b. Point Peninsula, N. Y., 7 Oct. 1833. He graduated at Union College 1858, taught physical science in New York State Normal College 1860–74, when he became professor of physics in Vassar College. He has written several elementary text-books on natural philosophy, chemistry, etc., the most recent being: 'Beginner's Guide to Chemistry' (1886); 'Laboratory Studies in Chemistry' (1894); 'Student's Manual of Physics' (1897).

Cooley, Thomas McIntyre, American jurist: b. Attica, N. Y., 6 Jan. 1824; d. Ann Arbor, Mich., 12 Sept. 1898. He was admitted to the bar in 1846 and became professor of law in the University of Michigan in 1859. He was elected justice of the supreme court of Michigan in 1864 and was chief justice of that State 1868–9, retiring from the bench in 1885. In 1881 he again became professor of law in the University of Michigan. His principal works are: 'A Treatise Upon Wrongs and Their Remedies' (1878); 'General Principles of Constitutional Law in the United States' (1880); 'Commentaries on the Constitution of the United States' (1873); 'Law of Taxation' (1876); 'Michigan' in 'American Commonwealth Series.'

Coolgar'die, Australia, a town in the interior of western Australia, about 330 miles east of Perth. It is the centre of a gold-mining district; the gold fields, discovered in 1891, have been rapidly developed. At first the lack of water was a drawback, but by artificial means an adequate supply is secured. Connections by railroads and telegraph have been made with Perth, Fremantle, and Albany. Pop. 5,000.

Coo'lidge, Susan. See WOOLSEY, SARAH CHAUNCEY.

Coolidge, Thomas Jefferson, American merchant: b. Boston, Mass., 26 Aug. 1831. He graduated at Harvard in 1850, began business as an East India merchant, but later became treasurer of the Amoskeag Manufacturing Company, and closely identified with the New England cotton industry, and large banking and railroad enterprises. He was president and is a director of the Chicago, Burlington & Quincy R.R.; an overseer of Harvard 1886–97; appointed minister to France by President Cleveland 1892; and a member of the joint high commission to adjust disputes between the United States and Canada 1899.

Coolidge, William Augustus Brevoort, American writer in England: b. near New York 28 Aug. 1850. He was educated in St. Paul's School, Concord, N. H., and Exeter College, Oxford, and was ordained to the priesthood of the Established Church in 1883. He was professor of English history at St. David's College, Lampeter, Wales, 1880–1; tutor at Magdalen College, Oxford, 1881–5, and curate of South Hinksey 1883–95. He is a member of various Alpine clubs and has published: 'Swiss Travel and Swiss Guide Books' (1880); 'The Adula Alps' (1893); 'The Range of the Todi' (1894); 'Guide to Grindelwald' (1900); 'Guide to Switzerland' (1901); beside many contributions on Alpine topics to periodicals and cyclopædias.

Coo'lie, a term commonly applied to laborers from India and China. The first coolie emigrants appear to have been Indians, brought from Calcutta, in India, to British Guiana, in 1839, soon after the abolition of slavery in that colony. As free negroes were found to be insufficient to perform the work that had previously been done by slave labor, and the whites could not endure hard labor in a tropical climate, the planters had to look for recruits from other places than Africa. The first attempt to use as laborers, people from India, proved unsuccessful because of the chigre or jigger, a most annoying insect. Various abuses existed almost from the beginning, in the treatment of the laborers, and for a time the government of India forbade the emigration, but it was again allowed when better regulations were made so that the coolies understood their rights, and, also, when health precautions were established in the colonies. For a certain specified amount, the coolies were bound for a term of years and after 10 years' service they were entitled to free passage back to their native country. The Chinese coolies were not entitled to this back-passage. To entice the skilled laborers to remain inducements were offered them, and many did remain. The coolies employed in Guiana, chiefly from India, were in 1891 in number 105,463. Coolies were introduced into Jamaica, the Mauritius, and other British colonies. In 1891 the Indian population of Mauritius was about 250,000 or two thirds of the whole population. In 1855 Great Britain undertook to suppress the importation of the coolies into the colonies in the tropics, and this enabled the Portuguese to gain almost entire control of the trade. The abuses which had crept in made the trade almost as bad as the trade in African slaves. The legislature of Jamaica, in 1869, passed a law requiring more humane treatment from employers toward their coolies. Macao, the Portuguese port at the mouth of the Canton River, China, sent large numbers of Chinese coolies to Cuba and Peru, and under conditions little short of absolute slavery, even kidnapping was practised with impunity. In 1874 a royal commission was appointed to investigate the coolie system in Mauritius. In 1856 the Peruvian government prohibited the introduction of Chinese labor in the manner then prevalent. In Brazil, where considerable numbers of coolies have been employed since 1852, they do not appear to have been treated with the same cruelty. In 1866 the matter was made subject to an international conference and improvements were made by agreements signed by China, France, and Great Britain. In 1873 the Portuguese government made the importation of coolies illegal, and the Indian Emigration Act of 1883 restricts emigration by contract to the colonies where good treatment is given to the laborers. The laws aimed at the correction of the abuses have practically stopped the coolie trade. Consult: Hope, 'In Quest of Coolies'; Jenkins, 'The Coolie'; and reports of the commissions.

Cooling, Velocity of, a body isolated in air or other gas, or *in vacuo*, and surrounded by

bodies colder than itself, loses heat, by radiation in the last mentioned case, and in the former case partly by radiation and partly by convection. The rate at which its temperature decreases depends on a variety of circumstances, —on the nature of its surface, for example. But, other things remaining the same, the velocity of cooling is proportional to the excess of the temperature of the body in question above that of its surroundings. This is Newton's Law of Cooling.

The law of cooling has been verified by Dulong and Petit experimentally. A copper ball was suspended in the midst of a metallic chamber, round the outside of which water was kept flowing, in order to maintain a constant temperature. The copper ball was heated before being suspended in the chamber, and a thermometer was inserted in a hole in the ball, and so arranged that the stem, which was long, projected to the outside of the chamber and could be read there. The fall of the temperature of the ball during equal intervals of time was noted, and it was found to become less and less as the temperature of the ball gradually approached that of the walls of the surrounding chamber, the law of decrease being Newton's, as stated above.

The following example will illustrate practically the meaning of this law: Suppose the temperature of the ball to be 20° higher than that of the enclosure at the beginning of the experiment, and that during the first five minutes it loses 1°, that is, one twentieth or 5 per cent of the excess of temperature. During the next five minutes it will lose 5 per cent of the excess that remains, that is, of 19°. It will therefore lose 0.95°, or the temperature of the ball will be 18.05° above that of the enclosure. At the end of the next five minutes the difference of temperatures of the ball and enclosure will be 17.15°, and so on.

Coomassie, koo-mäs'sē, or **Kumassi,** Africa, capital of Ashantee, in West Africa. The houses, formed of stakes and wattle-work filled up with clay, and thatched with palm leaves, are often furnished with arcades and ornamented with painting and carved work. Coomassie was captured in 1874, by the British, and again in 1896. In 1900 they took entire possession and it is now the seat of the British resident. It was made a railroad terminal in 1903. Pop. 18,000.

Coomans, Jean Baptiste Nicolas, zhŏñ bap tēst nik-ō-la, Belgian politician and author: b. Brussels 1813; d. 1896. He was elected to the Belgian house of representatives in 1848, and there became prominent in the clerical party. He was editor of the *Journal des Flandres;* the *Journal de Bruxelles;* the *Courrier d'Anvers;* and the clerical weekly, 'La Paix.' He wrote: 'Histoire de la Belgique' (1836); 'Richilde' (1839); 'Une Academie de Fous' (1861); 'Les Communes Belge' (1863); and 'Portefeuille d'un Flaneur' (1863).

Coomans, Pierre Olivier Joseph, pēār ō-lē-vē-ā zhō-zef, Belgian painter: b. Brussels 28 June 1816; d. 1890. He was educated at Antwerp as a pupil of De Keyser and Wappers. He later went to Algeria, where he spent several years; among his paintings which deal with African subjects are: 'The Deluge'; 'Landscape in the Province of Constantine'; 'Emigration of Arab Tribes'; 'Dancing Arab Women'; other works of his are: 'Conquest of Jerusalem'; 'Defeat of Attila'; 'Feast of the Philistines'; 'Lesbia'; 'Last Days of Pompeii.' In 1888 he made a visit to the United States with his two daughters, DIANA and HEVA. Both are artists also and have lived mostly in New York since 1890. Diana's pictures include: 'The Spinner'; 'A Fruit Merchant of Pompeii'; 'A Fete at Pompeii'; 'At the Callirhoe Spring'; 'Attentive Listener.' Among Heva's works are: 'Beautiful Days'; 'Pompeiian Flower Merchant'; 'Captive'; 'The Message'; and 'Under the Spell.'

Coombs, Annie (SHELDON), American novelist: b. Albany, N. Y., 1858; d. New York 1890. She wrote: 'As Common Mortals' (1886); 'A Game of Chance' (1887); 'The Garden of Armida.'

Coomptah, or **Kumpta,** a town of India, in the presidency of Bombay, division of Concan, district Canara, 100 miles north of Mangalore. It stands on the north side of Kumpta Creek, and was a place of consequence till it was pillaged and burned by the troops of Hyder Ali. After a long period of decline it has begun to revive, chiefly in consequence of the rapid extension of cotton cultivation in the district. Pop. about 11,000.

Cooper, Anthony Ashley. See SHAFTESBURY.

Cooper, SIR **Astley Paston,** English surgeon: b. Brooke Hall, Norfolk, 23 Aug. 1768; d. London 12 Feb. 1841. He studied medicine in Edinburgh and London and in 1792 he visited Paris, where he attended the lectures of Desault and Chopart. In 1793 he was appointed professor of anatomy at Surgeon's Hall; and in 1813 professor of comparative anatomy to the College of Surgeons, and became in 1822 one of its court of examiners. In this year appeared his great work 'On Dislocations and Fractures of the Joints.' Having performed a slight operation on George IV. he was created a baronet in 1821, after which his practice largely increased. In 1827 he was elected president of the Royal College of Surgeons. His 'Lectures on the Principles and Practice of Surgery' appeared in 1824–7.

Cooper, Charles Alfred, English journalist: b. Hull 16 Sept. 1829. Since 1876 he has been editor of the Edinburgh 'Scotsman.' He has published: 'Seeking the Sun,' a series of letters on Egypt (1891); 'Letters on South Africa' (1895); 'An Editor's Retrospect' (1896).

Cooper, Edward Herbert, English novelist. He was educated at University College, Oxford, and has published: 'Geoffrey Hamilton' (1893); 'Mr. Blake, of Newmarket'; 'Wyemarke and the Sea Fairies' (1900); 'Wyemarke and the Mountain Fairies'; 'The Monk Wins' (1901); 'Children, Race Horses, and Ghosts,' a collection of short stories; 'The Eternal Choice'; 'A Fool's Year' (1901); 'George and Son'; 'Wyemarke's Mother'; 'Resolved to be Rich'; 'The Twentieth Century Child' (1904).

Cooper, Ellwood, American horticulturist b. Lancaster County, Pa., 24 May 1829. For 10 years he was engaged in business in Port at Prince, Hayti, but went to California in 1870 and devoted himself to fruit culture. He was the first manufacturer of olive oil in the United States, inventing special machinery for the pur-

pose. He is also the inventor of machinery for hulling and pitting almonds, and for hulling and washing English walnuts. Since 1885 he has been president of the California State Board of Horticulture, and for three years was president of Santa Barbara College. He has published: 'Statistics of Trade with Hayti' (1868); 'Forest Culture and Eucalyptus Trees' (1876); 'Treatise on Olive Culture' (1882).

Cooper, Emma Lampert, American artist: b. Nunda, N. Y. She graduated at Wells College, and studied art in New York, Paris, Holland, and Italy; taught painting in Rochester, N. Y., 1893–7, but since 1898 has lived abroad. At the Chicago World's Fair (1893) she received a medal for her water color, 'The Bread Winner'; and another at the Atlanta Exposition (1895) for an oil painting, 'Behind the Dunes.' Others of her pictures are: 'Mother Claudius' (1890); 'Picardy Hillside' (1897); 'High Noon, Cape Ann'; 'Old Kitchen in Gruyere, Switzerland.'

Cooper, George Henry, American naval officer: b. Fort Diamond, N. Y., 27 July 1821; d. Brooklyn, N. Y., 17 Nov. 1891. He entered the navy in 1837, became captain in 1867, commodore in 1874, and rear-admiral in 1881. He was on sea service for more than 25 years, and on shore or other duty for more than 18. In the Florida Seminole Indian war he served in co-operation with the army; during the Mexican war he led an assault against Point Isabel, was captured at Monterey, and after being exchanged, took part in the attacks on Tobasco, Alvarado, and Tuxpan; during the Civil War he commanded, among other vessels, the monitor Sangamon, which was on picket duty inside the Charleston roads. He was commandant of the Brooklyn navy yard, and in command of the North Atlantic squadron from 1880 until his retirement, 27 July 1884.

Cooper, Henry Ernest, Hawaiian politician: b. New Albany, Ind., 28 Aug. 1857. He graduated at the Boston University Law School 1878; was admitted to the Suffolk County (Mass.) bar; and settled in Honolulu 1890. During the Hawaiian revolution of January 1893, he was chairman of the Committee of Safety, and on 17 Jan. 1893 read the proclamation abrogating monarchical government in the islands. He became a member of the advisory council in the provisional government; a circuit court judge 1893–5; minister of foreign affairs 1895–9; acting president of the republic, January to March 1898, and has served as head of the departments of justice, public instruction, and interior, and as attorney-general 1899–1900.

Cooper, Jacob, American clergyman: b. Butler County, Ohio, 7 Dec. 1830. He graduated at Yale 1852, studied theology in Edinburgh, took his Ph.D. at Berlin 1854, and became a Presbyterian clergyman. He was professor of Greek in Centre College, Kentucky, 1855–66; chaplain of the 3rd (Union) Kentucky regiment 1862–3; professor of Greek in Rutgers College 1866–83, and of philosophy and logic there since 1893. His published works include: 'The Eleusinian Mysteries' (1854); 'Biography of George Duffield' (1889); 'Biography of President T. D. Woolsey' (1899); 'Biography of President William Preston Johnston' (1900); 'The Passage from Mind to Matter' (1901); etc.; and frequent contributions to leading theological reviews, such as 'Bibliotheca Sacra,' 'Methodist Review,' 'Princeton Review,' and the Reformed Church 'Quarterly Review.'

Cooper, James, American senator: b. Frederick County, Maryland, 8 May 1810; d. Camp Chase, Columbus, Ohio, 28 March 1863. He graduated at Washington College, Pa., 1832, studied law and began practice at Gettysburg, Pa. He was elected to Congress 1838 and 1840; to the State legislature 1843–8; was attorney-general of Pennsylvania 1848, and elected a United States senator 1849. Subsequently he settled in his native town, and when the Civil War broke out took command of the Maryland volunteers, organized them into regiments, and on 17 May 1861 was made a brigadier-general. He was in command of Camp Chase at the time of his death.

Cooper, James, Scottish clergyman: b. Elgin 13 Feb. 1846. He was educated in the University of Aberdeen, entered the ministry of the Kirk of Scotland and was pastor of St. Stephen's, Broughty Ferry, 1873–81, and the East Parish, Aberdeen, 1881–98. He is a professor of Church history in the University of Glasgow and has published 'Aberdonensis'; 'Bethlehem'; 'Ecclesiology of Scotland'; 'Four Scottish Coronations.'

Cooper, James Fenimore: b. Burlington, N. J., 15 Sept. 1789; d. Cooperstown, N. Y., 14 Sept. 1851. His father, Judge William Cooper, removed in the year following the novelist's birth to recently acquired tracts of land, in the wilderness of central New York, about Otsego Lake, on the shore of which he had already fixed the site of the village of Cooperstown. Here he built the mansion called Otsego Hall, which his son acquired in after years, and in which he wrote the greater number of his works. Young Cooper entered Yale College at 13, but left the course half finished. In 1806 he went to sea in a merchantman, and served in the navy of the United States from 1808 till his marriage in 1811. For the next nine years Cooper was engaged mainly in managing and improving his farm possessions, first near Cooperstown, then in Westchester, with no discovered or suspected bent toward literature. Chancing to read a book of fiction that aroused his dislike, he professed himself able to produce a better, and being held half jocularly to the task, wrote 'Precaution,' published in 1820. It was only an indifferent novel, but it was praised by friends, and Cooper was drawn to give himself to authorship. In 1821 'The Spy' appeared, winning immediate popularity both in England and at home. Cooper's chance of success lay, not in graces of style, which he showed small disposition to cultivate, nor in imitation, but in his large knowledge of colonial and pioneer life and of the sea. In 'The Spy' he had utilized his acquaintance with many details of the Revolutionary struggle, and with Westchester as "the neutral ground." His next work, 'The Pioneers' (1823), concerned itself with life and folk in the wilderness about Cooperstown, where he had been brought up, and which he introduced, under the name of Templeton, as the centre of the action. In 1824 he published 'The Pilot,' in which he first makes use of his knowledge of seafaring. Suggested by 'The Pirate' of

Scott, it was written to show how much more might be made of expert nautical knowledge than Scott had been able to effect. It really created a new literature of the sea. In another year Cooper had completed 'Lionel Lincoln,' a panstaking novel of Boston and the Revolution, but never popular. This was followed (1826) by 'The Last of the Mohicans,' which became quickly famous, being translated widely into foreign tongues. Its popularity was mainly due to skilful handling of the Indian characters, Uncas and Chingachcook, and still endures.

In common with 1826, Cooper spent seven years in Europe, continuing his authorship, and supplying much needed knowledge of men and things. 'The Prairie,' 'The Red Rover,' 'The Wept of Wish-ton-Wish,' and 'The Water Witch' continued the series begun before he sailed. On account of distorted notions held abroad concerning the people of his country, Cooper wrote 'Notions of the Americans; Picked up by a Traveling Bachelor'; but the book failed of its purpose, edifying Americans rather than enlightening Europeans. He wrote, besides, three novels, 'The Bravo,' 'The Heidenmauer,' and 'The Headsman,' dealing with continental scenes and characters, but their American bias tended to lessen his popularity. His manner of meddling with unpersonal matters got him into some trouble at this time. He determined in consequence to write no more. Coming back to America, near the close of 1833, he found the general crudeness of taste, and the greed of wealth more pronounced, after his foreign stay, and he did not spare his criticism. The result was greater unpopularity at home than he had incurred abroad. His combative temper prompted his putting out the satiric novel of 'The Monikins' (1835), which had small effect. In the three years following he published 'Sketches of Switzerland' and 'Gleanings in Europe,' in which he gives his impressions of the Swiss, the French, the English, and the Italians, and renews his strictures on foreign and domestic faults. The result was increased bitterness and abuse. A dispute with the people of Cooperstown, over his rights in Myrtle Grove, on Otsego Lake, made matters worse, for the press of the State took sides against him, misrepresenting his motives and spirit in the case. Relief was at length secured from this sort of persecution; Cooper pursued the chief offenders for libel, and won his suits. In 1838 he published the two novels, 'Homeward Bound' and 'Home as Found,' and in the next year 'The History of the Navy of the United States,' a work long had in contemplation, and received with fresh abuse from the press. The resulting trouble was settled, by a board of arbitration, in Cooper's favor. In 1840 he published 'Mercedes of Castile,' and the famous 'Pathfinder,' followed the next year by 'The Deerslayer,' generally considered, with the preceding novel, the best of the Leather-Stocking Tales, which include, with these, 'The Last of the Mohicans,' 'The Prairie,' and 'The Pioneers.' Cooper's powers of description and portraiture were now at their best. In 1842 'The Two Admirals' and 'Wing and Wing' appeared, and in 1843 'Wyandotte,' and 'Ned Myers,' the latter being the true story of a sailor comrade of earlier years. In 1844 'Afloat and Ashore' came out in two parts. Three anti-rent novels, 'Satanstoe' (1845), and 'The Chainbearer' and 'The Redskins' (1846) followed; and in the last-named year 'Lives of Distinguished American Naval Officers' appeared. 'The Crater' (1847), 'Jack Tier,' and 'Oak Openings' (1848); 'The Sea Lions' (1849), and 'The Ways of the Hour' (1850), all indifferent novels, complete the list of his more considerable works. His death was at Cooperstown, where he had lived mainly since 1833. Cooper was of a social temper until opposition withdrew him from society. His judgments, except in matters of tact and policy, were generally acute and sound, and his integrity was heroic. His conceptions of the Indian character have been frequently disapproved, but were the fruit of deliberate study. The standard biography is Lounsbury's in 'American Men of Letters' series.

L. A. Sherman,
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Cooper, Myles, English loyalist: b. England 1735; d. Edinburgh, Scotland, 1 May 1785. He was the second president of King's College, now Columbia University, New York. He studied at Oxford, became Fellow of Queen's College in 1760, and in 1761 published a volume of miscellaneous verse of correct style, but full of artificiality and classical imitations. In 1762 he became assistant to Dr. Johnson, president of King's College, New York, and after a year as professor of moral philosophy, Cooper, then 28, was elected president in May 1763, upon the resignation of Johnson. Upon his accession the college had a faculty of four members. Both discipline and members rose during his administration, and George Washington praised him highly for his care of young Mr. Custis. From 1767 to 1771 Cooper was in England, and after his return to America showed himself not only a typical high-churchman and Tory, but the master of a trenchant and sarcastic pen. He published 'The American Querist' in 1774 and in the same year wrote 'A Friendly Address to All Reasonable Americans on the Subject of Our Political Confusion,' a pamphlet answered by Alexander Hamilton, then an undergraduate at King's, and by Maj.-Gen. Charles Lee, who rivaled Cooper in virulence. His 'What Think Ye of Congress Now?' (1775) urged that Americans were not bound by the decrees of Congress, as that body had transcended the powers granted to it. In the same year he was forced to leave New York, narrowly escaping ill-treatment at the hands of a mob. His departure from America he described in a poem in the 'Gentleman's Magazine' for July 1776. In England he received a parish in Berkshire after a short residence at Oxford, where he preached in 1770 a sermon entitled 'National Humiliation and Repentance Recommended, and the Causes of the Present Rebellion in America Assigned,' a violent attack on the English Whigs. During the last years of his life he was senior minister of the first Episcopal Chapel in Edinburgh. John Trumbull, in 'McFingal,' speaks of "punster Cooper's reverend head," and he seems to have been a wit of rather free and convivial habits.

Cooper, Peter, American manufacturer, inventor, and philanthropist: b. New York 12 Feb. 1791; d. there 4 April 1883. His early education was of the scantiest description, and in boyhood he assisted his father in making hats, at 17 learning the trade of coachmaking. He



PETER COOPER.

subsequently invented a cloth-shearing machine and engaged in various occupations, finally settling upon the manufacture of glue, which he carried on for half a century. About 1830 he became interested in iron manufacture and in 1845 removed his iron business from New York to Trenton, N. J., and was the first to roll wrought iron beams for fire-proof structures. In 1830 he built from his own designs the first locomotive engine ever constructed in America. He was also interested in the canal system of his native State, and, at a later date, in telegraphic communications, being president of several telegraph companies. He took an active share in the enterprise which resulted in laying the first Atlantic cable. In 1876 he was nominated for the presidency of the United States by the Independent party, receiving nearly 100,000 votes at the autumn elections. In 1854 he established in New York the well-known Cooper Union (q.v.). He published 'Political and Financial Opinions with an Autobiography' (1877); 'Ideas for a Science of Good Government' (1883).

Cooper, Samuel, American military officer: b. Hackensack, N. J., 12 June 1798; d. Cameron, Va., 3 Dec. 1876. He was graduated at the United States Military Academy in 1815 and served on the staff of General Macomb from 1828 to 1836, when he was promoted captain. He was assistant adjutant-general from 1836 to 1841, and in 1848 was brevetted colonel for meritorious service during the Mexican war. In 1852 he was appointed adjutant-general of the army. He resigned this commission at the outbreak of the Civil War and tendered his services to the Confederacy, under which he became adjutant-general and inspector-general of the army. He wrote 'A Concise System of Instructions and Regulations for the Militia and Volunteers of the United States' (1836).

Cooper, Susan Fenimore, American author: b. Scarsdale, N. Y., 1813; d. Cooperstown, N. Y., 31 Dec. 1894. She was the daughter of James Fenimore Cooper, and during the last years of her father's life was his secretary and amanuensis. She was author of 'Rural Hours' (1850); 'Fields Old and New' (1854); 'The Shield: A Narrative'; 'Mount Vernon to the Children of America' (1858); 'Rhyme and Reason of Country Life'; etc.

Cooper, Theodore, American engineer: b. Cooper's Plains, N. Y., 12 Jan. 1839. He graduated at Rensselaer Polytechnic Institute, Troy, N. Y., in 1858, entered the United States Navy as engineer officer 1861–72, and was assistant professor at the Naval Academy 1865–8. In 1872 he assisted Capt. James B. Eads in the construction of the St Louis bridge, becoming, after its completion, engineer and superintendent in charge. Later he held important positions with the Delaware Bridge Company, Keystone Bridge Company, and as assistant engineer in charge of the construction of the first New York elevated railroads. He was one of the five expert engineers appointed to determine the Hudson River bridge span. He is consulting engineer for the New York Public Library, and for the Quebec bridge. He is an authority on all matters relating to iron and steel construction.

Cooper, Thomas, American physicist and politician: b. London 22 Oct. 1759; d. South Carolina 11 May 1840. He was educated at Oxford, studied law and medicine and was admitted to the bar. Entering into the political agitations of the period, he was sent by the democratic clubs of England to the affiliated clubs in France. In this latter country he took part with the Girondists, but perceiving their inevitable downfall escaped to England. While in France he had learned the secret of making chlorine from common salt, and he now became a bleacher and calico printer in Manchester, but his business was unsuccessful. He next came to America, and uniting with the Democrats opposed with vivacity the administration of John Adams. For a violent newspaper attack on Adams in 1799, he was tried for a libel under the Sedition Act of 1800, and sentenced to six months' imprisonment and a fine of $400. The Democratic party coming into power, he transacted in 1806 the business of a land commissioner on the part of the State of Pennsylvania with such energy as to triumph over difficulties with the Connecticut claimants in Luzerne County, but being appointed to the office of judge, became obnoxious to members of his own party, and was removed in 1811. He then successfully occupied the chair of chemistry in Dickinson College, in the University of Pennsylvania, and in Columbia College, S. C., of which last institution he became president in 1820, and in which he was also professor of chemistry and political economy. On his retirement in 1834, the revision of the statutes of the State was confided to him, and he died in the performance of his duty. Cooper was alike eminent for the versatility of his talent and the extent of his knowledge. He published in 1794, in London, a volume of 'Information Concerning America'; in 1800 a collection of political essays; in 1812 a translation of the 'Institutes of Justinian'; in 1819 a work on 'Medical Jurisprudence'; in 1812–14 two of the five volumes entitled the 'Emporium of Arts and Sciences'; and in 1826 'Lectures on the Elements of Political Economy.'

Cooper, Thomas, English Chartist and poet: b. Leicester 28 March 1805; d. Lincoln 15 July 1892. While a shoemaker's apprentice he studied assiduously, and in 1828 became a schoolmaster and Methodist preacher. In 1841 he prominently identified himself with the Chartist movement as a leader, and was arrested in the following year on a charge of sedition. During his subsequent imprisonment for two years in Stafford he wrote a Spenserian poem, entitled 'The Purgatory of Sucides,' and some stories published under the title of 'Wise Saws and Modern Instances.' Among his other works may be mentioned 'Baron's Yule Feast' (1846), a poem; 'Alderman Ralph' (1853); and the 'Family Feud' (1854), two novels. He lectured much in London and the provinces, and contributed articles to various newspapers. In 1855 he abandoned free-thinking and began lecturing on Christianity. His autobiography appeared in 1872, and his 'Thoughts at Fourscore and Earlier' in 1885.

Cooper, Thomas Sidney, English landscape and cattle painter: b. Canterbury 26 Sept. 1803; d. there 7 Feb. 1902. He studied at the Royal Academy School, went to France in 1827, and settled for three years in Brussels, where he learned much from Verboeckhoven. In 1833 he

exhibited at the Academy, and in 1807 was elected Royal Academician. He exhibited at the Royal Academy 67 years successively. Among his works are: 'Wreckers in Cumberland' (1841); 'Patrick Shepherds' (1842); 'Cattle at Pasture' (1843); 'Summer Evening' (1846); 'Charge of the Heavy Brigade — Waterloo' (1847); 'Berwick Meadows — Sunset' (1850); 'Crossing Newmarket Moor in a Snowdrift' (1850); 'Stonehenge' (1867); 'Milking Time in the Meadows' (1869); 'Passing Shower' (1870); 'Chesterfield in Mist' (1872); 'Monarch of the Meadows' (1873); 'There's no Place like Home' (1874); 'God's Acre' (1875); 'Maternal Affection' (1876); 'A Cool Retreat' (1877); 'My Boy' (1877); 'Victor's Shout' (1879); 'Isaac's Substitute' (1880); 'Summer Evening in the Marshes' (1880); 'On Deal Common' (1880); 'Scape Goat' (1881); 'Summer Afternoon' (1882); 'A Sedgy Brook in the Meadows' (1883); 'In the Rob Roy Country' (1883). In 1882 he presented a gallery of art to his native town, and in 1890 published an autobiography entitled 'My Life.' His work is neat and highly finished in character, but conventional and displays no sympathetic study of nature, but rather an excellent imitation.

Cooper Creek, or **Barcoo,** called by the latter name chiefly in its upper course, the largest inland river in Australia. It rises in Queensland at about lat. 25° S., and flows at first southwest and then in a westerly direction, into Lake Eyre. It was on the lower course of this river that Burke, Wills, and King, the explorers, had their headquarters, and here the first two died of starvation, while King was found in the company of natives, after having suffered fearfully from lack of food. See AUSTRALIA.

Cooper River, a river of South Carolina, rising in the eastern part of Berkeley County, flowing across the county in a generally southerly course, and emptying into Charleston Harbor. Although the river has a very short course, it is remarkable for its breadth. It forms, with the Ashley River, the peninsula upon which the city of Charleston is situated.

Cooper Union, or **Cooper Institute,** an institute founded in New York in 1854 by Peter Cooper. Its object is to provide free schools of art and science, and free reading rooms and library for the working classes. The founder chose the word "Union" because he hoped that other liberal persons would unite with him in providing the means for carrying into effect his benevolent intentions. The Cooper Union building was erected at the junction of Third and Fourth avenues, and cost $630,000. An endowment fund was created by the gift of $100,000 during Mr Cooper's lifetime and another $100,000 was added by his will. The William Cooper memorial foundation was $310,000. The fund has received additional gifts from time to time from Edward Cooper and Abram S. Hewitt, and in 1890 Andrew Carnegie gave $300,000 and later $300,000 more. The increase of annual revenue amounting to $25,000 provided by the three donors last mentioned was intended for the purpose of establishing a day school and of enlarging the operations of the night classes by the addition of special instruction in chemical, electrical, and thermodynamic knowledge. The expenditure made necessary by preparation for enlarging the work of the institute amounted to about $22,000 additional, which was contributed chiefly by Mr. Cooper and Mr. Hewitt. The courses in science include engineering, electricity, chemistry, physics, astronomy, and mechanical drawing, and those of art include architectural, industrial, and ornamental and free-hand drawing, clay modeling, and painting. Instruction is given in music, English literature, wood engraving, and pottery. The institute confers degrees in science and in civil, mechanical, and electrical engineering. There are several scholarships. Additional advantages are offered by lecture courses, a museum, an art gallery, and a library of 30,481 volumes, with a reading room containing current numbers of nearly 500 magazines and newspapers. The institute is divided into the following departments: Night School of Science, Day School of Science, Naval Architecture Class, Night Art Department, Woman's Art School, Stenography and Typewriting School, Telegraphy School, Elocution Class, Oratory and Debate Class. The total number of students in the several departments in 1902 was 3,400. The People's Institute, although holding their meetings in the Cooper Union Building, are not branches of the Cooper Institute.

Cooperage, the art of making vessels of pieces of wood bound together by hoops. Such vessels were in use among the Romans at the period of the Christian era. The upright pieces for the sides of a barrel or cask are called staves. The swelling at the middle of the barrel, called the belly or bulge, is formed by skilfully shaping each stave broad in the middle and narrowed at the ends so as to form part of the required double conoid. A skilful cooper can work this curve so accurately that no further fitting or alterations shall be needed when the staves are put together. The staves are made to meet at their inner edges and by driving the hoops very hard, the inner part is compressed till the slight gaping outside is closed, and thus slight inaccuracies of fitting are remedied. The bulging shape of barrel and cask seems only a fashion. It has been suggested that the purpose is only to make more difficult the cooper's trade. During the last few years a strong effort has been made to introduce perfectly cylindrical casks in their place; the room saved in packing cars, etc., being the strongest argument for the new shape, which could be made by much cheaper machinery besides.

There are several branches of cooperage. The wet or tight cooper makes vessels for holding liquids. The dry cooper does inferior work, such as barrels for containing dry goods, where an inferior degree of accuracy is sufficient. The white cooper makes churns, pails, etc., which for the most part have straight sides. The best work is made of oak, which must be thoroughly dried before being put together. In warm countries, the drying of the sun is sufficient, and casks are therefore mounted in summer only; but in the United States, artificial drying is commonly resorted to. The hoops are hammered down from the narrow to the wide part of the cask, by means of a mallet striking a piece of wood held against the hoop. Iron hoops are sometimes put on hot, in order that their contraction on cooling may bind the work together. Most ingeniously constructed machinery is now generally used in barrel-making.

Co-operation, in modern parlance the association of people for the accomplishment of any desired end, especially the association of working people for the management of their industrial interests in store, workshop, or other undertaking, and the equitable distribution of profits. The advantages of co-operation consist in the lower prices paid for the ordinary articles of life and of manufacture, the common use of capital, machines, buildings, water power, and in common production. Instances of co-operative industry have been discovered among English miners and New England fishermen in the 17th century, and among Greek sailors of the Levant. Co-operative societies established as early as 1777–95 are still in successful operation. The earliest in England was founded in 1794 at Mongewell, in Oxfordshire, by Shute Barrington, bishop of Durham. During the Owenite agitation, between 1820 and 1845, hundreds of co-operative societies rose up. Robert Owen (q.v.), failing to convert his brother manufacturers to the innovations he had introduced for the benefit of his operatives in his New Lanark mills, appealed to the government to adopt measures that would alleviate the poverty of the laboring masses, but without success. He therefore abandoned these efforts, and turned to the task of establishing co-operative communities that would put his ideas into practice. One hundred and seventy shops had been organized under the Owen plan in 1830, but four years later most of these had ceased to exist.

The modern movement first took practical and permanent form with the formation of the Rochdale Society of Equitable Pioneers in 1844. The founders were 28 Lancashire weavers, nearly all Socialists of the Owen school and Chartists. The original capital was $140, slowly collected by subscription of two pence, and afterward three pence a week. With this capital they opened a store for supplying themselves with provisions; but at first they had only flour, butter, sugar, and oatmeal to sell. They limited the interest on shares to 5 per cent, and divided the profits among members in proportion to their purchases. When it was proposed to take out a license for the sale of tea and coffee the members did not pledge or subscribe amounts, but "promised to find" small amounts ranging from two pence to one pound, and the latter sum was actually the largest offered. A motion was made that members who would not trade with the store be paid off, but those who desired to see co-operation advance under the principle of freedom opposed the motion, and it was withdrawn. At the end of 13 years they had a membership of 1,850, a capital of $75,000, and their annual sales amounted to $400,000. This successful society with its organization and methods of conducting business became a model which was followed in many parts of England and abroad. In 1864 a wholesale society with annual sales amounting to over $200,000,000, with a membership of 1,512,399 and a capital of nearly $330,000,000, was established at Manchester, and in 1869 a second at Glasgow. They work in harmony and are practically one institution. The wholesale society is a federation of retail societies for the supply of goods to the various societies composing it, with purchasing and forwarding depots in England, the United States, and on the continent. It owns eight steamships. It has extensive productive works, boot and shoe factories, woolen cloth works, corn mills, etc. There is also a co-operative fire and life insurance society. Since the inception of the co-operative stores in Great Britain a business of $4,500,000,000 has been transacted and $360,000,000 in dividends paid to their members. The Woolwich Society is an organization of 10,000 men and women. They own six stores, the finest bakery in London, farms, stables, tailor shops, boot and shoe works, etc. One of the most notable examples of that kind of co-operation that includes profit-sharing is the South Metropolitan Gas Company, whose receipts are shared with 3,000 employees. The Leeds Co-operative Store is perhaps the most famous single experiment. It is evident that probably 1,000,000 families, or a sixth of the whole population of England, have their wants in whole or in part supplied by co-operative stores.

Building and loan associations (q.v.) are purely co-operative organizations, and existed in form in England as early as the latter part of the 18th century. The date generally assigned for their beginnings in that country is 1836, for in that year Parliament adopted an act for their regulation. The Friendly societies are co-operative in reality, though not in name. In 1827 the first English paper for the propaganda of co-operation was established, entitled the Brighton Co-operator. In 1871 the Co-operative News was established as the organ of the societies. Since 1869 annual congresses of co-operative societies have been held throughout England. The Congress of 1902 had 1,100 delegates, with reports for 1901 from 1,604 societies, giving a membership of 1,919,555; a gain of $7,291,000 in shares, $2,574,474 in profits, and $6,614,124 in investments. Nearly $45,000,000 was distributed to members during the year as cash dividends. In the Australian colonies co-operation has made a marked advance. There are many Friendly societies there. In 1873 the Co-operative Union was consolidated, with a regular constitution. It is governed by a board of 12 members, representing the six sections into which the union is divided. There were 48 additional societies not reporting. The movement for co-operation in Ireland has lately shown a decided progress. There are in the island 232 co-operative dairy or creamery societies, 101 agricultural societies, 52 co-operative banks, and 39 other organizations; total membership 40,000. Although in Great Britain co-operation has succeeded best in the form of distribution, that is, in co-operative stores for supplying the domestic wants of the workman's family, in continental Europe other phases of the movement have been more prominent.

In France co-operation began with the Revolution, and that nation is one of the few in which the state has stepped in to aid associative ventures of this kind. Building contracts have been awarded co-operative industries by the government, and M. Waldeck-Rousseau's known friendliness to the principle has awakened encouragement among the members of the various societies. Co-operation in different modes of agriculture has achieved some success in France. In 1900 there were 2,500 co-operative societies, 1,489 being devoted to distribution. Two hundred and fifty workshops are operated according to this principle. Paris has a very large and successful society. In Germany and Italy the

co-operative idea led to the formation of many people's banks, furnishing mutual credit to workmen and small tradesmen. The Peoples Banks in Germany were founded by Schulze-Delitzsch, the probable date being 1851. Schulze traveling through Germany, addressing large audiences, and explaining his plan. He encountered the most determined opposition. Bismarck obstructed the movement. Yet these credit loan institutions spread, and Germany today possesses thousands of them. Schultze himself organized 3,000. There are many throughout Europe. These banks charged in the beginning a high rate of interest — 12 or 14 per cent — though it has since become much lower, and only short-time loans are permitted. The members of most of these credit loan institutions hold but one share, the price of which is placed high, and this is paid in small instalments, the object being to encourage the inclination to save. The total membership of co-operative societies in Germany is about 2,000,000. Productive societies to the number of 255 are engaged in a large variety of industries. There are 1,527 societies engaged in distribution. The spread of the co-operative idea has been especially remarkable in Switzerland and Denmark. In Switzerland in 1897 there were 2,223 co-operative societies, 838 of which were co-operative dairies. These had grown in 1900 to 3,400 societies, 1,400 being dairies. There were 370 organizations for distribution. One sixth of the population are co-operators. In Denmark there are 837 distributing societies and 1,052 co-operative dairies producing an annual output of butter worth $33,000,000.

The agricultural societies were organized in five central bodies, their aims being to purchase provisions, to sell their own products at a profit, to protect their members against over-production, to diminish the cost of production, and to improve and educate their members.

At the end of 1897 there were in the Netherlands 697 societies, 253 of which were for exploiting milk, butter, cheese and other products. In 1900 the total number of organizations had grown to 2,000. The co-operative societies of Belgium numbered 1,000, the dairies leading (227), and doing a business of $3,250,000. In Ghent there is an organization of 25,000 workingmen sharing the profits of stores and factories conjointly owned. A vast baking system is carried on in the same way. Marked progress has been made in Italy, where the Church has taken an active interest in organizations for the benefit of the people. There are in that country 1,200 distributing societies with annual sales amounting to about $10,000,000; 1,737 co-operative banks; 750 dairies and 513 productive labor societies.

In Hungary an interesting feature of co-operation is the share which the state takes in it, as a member adding 1,000,000 crowns to the capital. In that country there are 1,002 banks, many dairies and various other co-operative undertakings. Austria has 5,092 organizations, most of them being of the nature of credit societies. Figures for Russia are not available later than 1896; 1,442 societies were then in existence, 605 of which were banks. Even in Spain the movement is being felt, though the number of its adherents is comparatively small.

In the United States co-operation has made comparatively slow process. A co-operative store in Kingston, Mass., is said to be the oldest existing experiment on the Rochdale plan. It was organized in 1875, but its annual trade is small. These were various co-operative associations formed in the late forties and the early fifties. A bulletin of the Department of Labor issued in 1886 states that "none survive." In modified form, however, one or two still exist, among which is the Protective Union of Worcester, Mass., and the Central Union Association of New Bedford, Mass., organized respectively in 1847 and 1848. In 1886 co-operative business in New England included creameries, banks and building associations. A co-operative coopering association was established in Minneapolis in 1874. In 1882 the students of Harvard University formed a society for supplying themselves with books, stationery, and other articles. It has been a great success and has been imitated at Yale and other colleges. The co-operative creameries in certain of our northwestern States have achieved an astonishing measure of success. Minnesota probably leads in the number and value of creameries in the United States, though New England — Massachusetts notably — has many of them. In 1901 more than 50 Farmers' Co-operative Grain associations were formed in Kansas. The Co-operative Association of America, organized during the same year, in Lewiston, Me., was started with the purpose of developing a federation of various lines of business, beginning with a grocery. The profits are divided semi-annually among the co-operators. In 1901–2 the association accumulated $250,000, and reported a business of $600,000. There are many co-operative communities in the United States, varying much in their methods and characteristics. They have been classified as communistic, socialistic and partially co-operative. So far as it has gone the co-operative movement has been a real and effectual training for the intelligence, business capacity, and moral character of the workmen. It has taught them thrift, foresight, self-control, and the habit of harmonious combination for common ends.

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HENRY DEMAREST LLOYD.

Cooperia, koo-pē'rī-a, a genus of plants of the *Amaryllis* family (*Amaryllidaceæ*), so named in honor of Joseph Cooper, a curator of the Botanical Society of London. They are low herbs with coated bulbs, and narrow grass-like

leaves, with flowers somewhat resembling the atamasco lily. There are two known species in the United States, natives of the Southwest, and of Mexico. Drummond's Cooperia (*A. Drummondii*) grows on the prairies from Kansas through Louisiana to Texas, New Mexico, and Mexico. The flower is very fragrant, and because of its habit of blooming at night or in the early evening, is known as the evening star. The giant fairy-flower (*C. pedunculata*) is a favorite for cultivation, as it thrives well in ordinary garden soil, and if placed in a root-cellar in dry soil with an even temperature, will bloom again in the spring.

Cooper's Hill College, properly the Royal Indian Engineering College, at Cooper's Hill, Eng., on the borders of Surrey and Berkshire, was founded in 1871 for the training of candidates for the Indian Public Works Department, the Indian Forest Department, etc. The ridge known as Cooper's Hill (142 feet high) affords a fine view, and gave its name to a poem by Sir John Denham.

Cooperstown, N. Y., village and county-seat of Otsego County, at the outlet of Otsego Lake, and on the Cooperstown and Charlotte Valley R.R.; 90 miles west of Albany. It is noted as having been the residence of James Fenimore Cooper, the novelist. It has Thanksgiving Hospital, a Union free school, knitting mills, national bank, a box factory, and a cheese factory. This was once an old Indian town, but as early as 1769 was owned by George Croghan, and in 1785 was purchased by William Cooper, the father of James Fenimore Cooper. Pop. 2,415. See JAMES FENIMORE COOPER.

Co-or'dinates, in geometry, a term applied to lines, to which points under consideration are referred, and by means of which their position is determined. Co-ordinates determine the position of a point in space or in a plane which is understood to contain all the figure under consideration. They determine position by straight lines only, or by a straight line and angles; in the latter case they are called *polar* co-ordinates. When co-ordinates are at right angles to each other they are called *rectangular* co-ordinates, and when they make any other angle they are *oblique* co-ordinates. Spherical co-ordinates are used for the fixation of celestial objects in the celestial sphere. The term co-ordinate is used because various points in a curve fixed by such lines may be treated in order. Descartes first introduced this method.

Co-ordination (Lat. "arranging in order," "ranking together"), a physiological and psychological term, indicating the normal and harmonious operation of the muscles, especially the voluntary ones, in such actions as walking, motion of the arms, and mastication. Co-ordination is dependent on the perfect and complete action of the sensory nerves and upon the healthy condition and proper interrelation of the muscles concerned. Its failure is usually due to affections of the brain or spinal column and, if the theory of many physiological psychologists be accepted, to any abnormality of the cerebellum, which is reckoned the seat of co-ordination, notably in relation to locomotion. Such lack of co-ordination is styled ataxia. This term is a Greek antonym of co-ordination and implies disorder. Ataxia, although its actual cause, save in the case of the hereditary variety which usually develops between the ages of 4 and 18, is disorder of the spinal column, has many immediate causes, accompanying alcoholism and following diphtheria. Both hereditary and primary ataxia commonly attack the limbs, and locomotor ataxia is the best-known form of lack of co-ordination.

Coorg, or **Koorg,** British India, province bounded by Mysore on the east and northeast, and the districts of South Canara and Malabar on the west; area, 1,583 square miles. The country in general is extremely rugged, and covered with forests, in some parts abounding in sandal and other valuable woods, but in others overrun with jungle, the resort of elephants and beasts of prey; climate is temperate and healthy; soil fertile, and in many parts well cultivated, yielding in abundance rice of superior quality. Great numbers of cattle are reared. Coffee, pepper, cardamoms, and other spices are raised. The manufactures are insignificant. The capital is Merkara. The old fortifications are interesting. High ramparts and deep ditches are so arranged as to be most effective in checking the advance of an enemy. Pop. 180,500.

Coornhert, Dirck Volckertsen, dĕrk fŏl'-kĕrt-sĕn kôrn'hĕrt, Dutch poet and scholar: b. Amsterdam 1522; d. Gouda 1590. In 1562 he became secretary of the city of Haarlem, and opposed the Spanish power, until he was imprisoned for a short time, and on his release forced to flee to Cleves and Xanten. In 1572, when the Dutch successfully revolted against Spain, he was made state secretary of the States of Holland. By his poetical writings, 'Book of Songs' (1575), 'Right Use and Abuse of Worldly Possessions' (1585), and several dramas, as also by his elegant translations from Boccaccio and the classics, he earned the title of "restorer of the Dutch language."

Coos Bay, an indentation on the coast of Oregon. It extends into the land about 15 miles and is only one mile in width, thus making it a safe harbor. Marshfield and Empire City are on Coos Bay.

Coosa (koo'sa) **River,** in Floyd County, in the northwestern part of Georgia, is formed by the junction of the Ostanaula and the Etowah rivers; it flows southwest into Alabama and about eight miles north of Montgomery it unites with the Tallapoosa River and forms the Alabama. Its length is about 350 miles. It is navigable for boats of light draft for some distance above its mouth.

Coosy, koo'sē, or **Kusi,** a river of India, rising in Nepaul, and flowing first south southeast to the British frontier, and then nearly due south to the Ganges. It is very rapid and difficult to navigate. Its total length is about 325 miles.

Coot, a strictly aquatic bird of the genus *Fulica,* sub-family *Fulicinæ* and family *Rallidæ,* also called water-hens and crow-ducks. About 10 species are known, distributed throughout the world; but mostly in South America, which has six. The American coot, *F. americana,* is abundant throughout North America, breeding wherever found and resident in the South. Its appropriate habitat is shallow reedy ponds, and sluggish streams. The nest is a disordered heap

of reeds or similar material in or near the water, in a hollow of which 8 to 12 eggs, clay-colored, with brown spots, are deposited. The length of the bird is 14 to 16 inches, but the body is remarkably compressed, and the feet are nearly unique in the lobate webbing of the toes. The color is generally sooty slate, with the lower belly and some other parts white and the bill red at tip and base. The coot is much sought by gunners about the interior lakes. The European coot (*Fulica atra*) is a closely similar bird, slaty in color, with a bare patch on its head, whence the name bald coot; it is found throughout Europe and in Asia.

Coote, Sir Eyre, British military officer: b. County Limerick, Ireland, 1726; d. Madras 26 April 1783. He entered the army at an early age; and from 1754 to 1762 served in India. It was by his arguments that Clive was induced to risk the battle of Plassey, and for his services in this and other engagements, Coote was in 1759 given the command of the newly raised 84th regiment. In this year he gained the great victory of Wandiwash; and his capture of Pondicherry in 1761 completed the downfall of the French in India. Coote returned to England, and was knighted in 1771. In 1779 he assumed the command-in-chief in India, with the rank of lieutenant-general, and in 1781 he routed Hyder Ali at Porto Novo.

Coote, Sir Eyre, English soldier: nephew of the preceding: b. 1762; d. about 1824. He served as ensign in the English army in the battle of Brooklyn and various other engagements during the war of the American Revolution, became a major-general in 1798, and was made commander-in-chief of the island of Jamaica in 1805.

Coote, Richard, 1st Earl of Bellomont, English colonial governor: b. 1636; d. New York 5 March 1701. In 1695 he was appointed Colonial governor of New England, and was given special authority to arrest pirates. An expedition was fitted out with Capt. Kidd in command, but the latter's own piratical acts caused his arrest in Boston, whence he was sent to England for trial.

Copacabana, kō-pā-kā-bā'nā, Peru, a small peninsula on the south shore of Lake Titicaca. It was the sacred place of the Incas, and many ruins of temples and of other buildings are still extant. There is here now a shrine of the Virgin Mary which is visited annually by thousands of pilgrims.

Copaiba, kō-pā'ba, the oleoresin of *Copaiba Langsdorfii* and other species of copaiba. Of these at least 16 are known to give this drug, and seven are known to yield a product that is sent to the United States. Oleoresin copaiba comes mostly from Brazil and the West Indies; it is found in special secretory passages in the wood from which it is obtained by deep gashes cut into the tree, much as turpentine is obtained from pine trees. The oleoresin flows in a steady stream, one tree often yielding as much as from 10 to 15 gallons. Copaiba as it comes into the market varies much in age and variety. The finer sort of Para copaiba is a thick liquid, clear, somewhat resembling Canada turpentine. It may be darker, sometimes resembling sherry. It has a specific gravity of .996, does not mix with water, but is soluble in ether. Distilled with calcium hypochlorite it yields chloroform. Copaiba oil has a peculiar aromatic odor which is extremely disagreeable. The chemical composition of copaiba is extremely complex. It contains at least from 40 to 80 per cent of oil and a large amount of resin, which consists largely of copaivic acid ($C_{19}H_{30}O_2$). Oxycopaivic acid and meta copaivic acids are also found. The action of copaiba is largely exerted on the genito-urinary system, where it acts as a stimulant diuretic and irritant, and is particularly useful in diseases of the bladder, urethra and mucous membranes of the pelvis and of the kidneys. It may be used in bronchial affections also, but is rarely thus employed because of its disagreeable taste and because it very frequently causes an eruption. It is usually administered in gelatine capsules. Its chief commercial use is as a vehicle in oil painting and as a varnish.

Copais, kō-pā'īs, formerly a lake of Greece, in Bœotia, fed mainly by the River Cephissus. The only outlet for water collected in this depression was afforded by a number of subterranean channels, called *katavothra,* on the eastern side, and as these were not always sufficient to carry off all the water a shallow marshy lake was formed which varied in size according to the season of the year. In ancient times the land was drained, and from a marsh it became a fertile country; but after a time neglect made it again a shallow lake. In 1886 a French company undertook to again drain off the water, and after working for some time they were superseded by an English company. In 1894 the work was completed and about 60,000 acres of good soil was reclaimed. Consult: Curtius, 'Die Deichbauten der Minyer.' See Bœotia.

Co'pal, a group of very hard resins derived from a great variety of plants both recent and fossil, the botanical names of which are not determined beyond doubt. Its chemical composition is: Carbon 78 to 80.5, hydrogen 8.7 to 10.5, and oxygen 9 to 10.7 per cent. The harder sorts are chiefly derived from fossil sources. In the recent state the resins have been obtained from species of *Trachylobium hymenæa* and *Guybourtia* from Africa, South America and the West Indies. Copal occurs for the most part in irregular pieces. As found in nature all of the fossil gums are covered with a crust of oxidized gum, the result of fossilization. This must be removed by chipping or scraping, or by the aid of alkalis, to prepare the gum for market. The Zanzibar and Angola varieties then have a characteristic "goose-flesh" appearance. Copal is without taste or odor; it has a conchoidal fracture, and a tendency to break into six-sided fragments. It is used in the manufacture of varnish, its particular value arising from its hardness which is about 3 of the mineral scale. The softer varieties are of recent origin, and are known as "spirit copals" because soluble in alcohol or turpentine.

Copal'chi Bark, a bark resembling cascarilla bark in its properties, and produced by a shrub of the same genus, *Croton niveus,* a native of Mexico and of Central America. The bark is in quills a foot or two in length, and has a thin corky epidermis. Copalchi bark is much used as a substitute for cinchona in Mexico, where it goes by the name of *Quina blanca,*

and is imported, though not to a large extent, into Europe. It contains a minute proportion of a bitter alkaloid resembling quinine, and is somewhat weaker than cascarilla bark.

Copan, kō-pän', Honduras, C. A., an Indian village in the southwest, in a mountainous region. The site of an ancient city, some of the ruins of which still remain. The buildings were of stone, and the carvings still preserved show a proficiency in architecture not attained by many of the aborigines. In 1530 the place was captured by Hernando de Charez.

Coparcenary, in law, partnership in inheritance; joint heirship in which each is entitled to a distinct share of the benefits, while the property remains undivided. It commonly arises from the custom of dividing equally among coheiresses the property of a man who dies intestate; but even in England, where the eldest son is usually sole heir, local custom may create coparcenary among male heirs.

Cope, Arthur Stockdale, English portrait painter: b. 1857. He is a son of C. W. Cope (q.v.) Among noted portraits by him are those of the present German emperor, Lord Roberts, the Duke of Cambridge, and Lord Kitchener.

Cope, Charles West, English painter: b. Leeds 28 July 1811; d. Bournemouth 21 Aug. 1890. He studied at the Royal Academy and in Italy, and first exhibited at the Academy in 1831. In 1843 he gained a prize of £300 for his picture, 'The First Trial by Jury'; in 1844, by his fresco, the 'Meeting of Jacob and Rachel,' he secured the commission for one of six frescoes for the House of Lords, producing accordingly 'Edward the Black Prince Receiving the Order of the Garter.' Altogether he executed eight frescoes from English history of the 17th century for the House of Lords, while his other works were numerous, the subjects being historical, romantic, or domestic. Of these some of the most important are 'Nereids' (1836); 'Cotter's Saturday Night' (1843); 'Last Days of Wolsey' (1848); 'King Lear' (1850); 'Milton's Dream' (1850); 'Pilgrim Fathers' (1857); 'Evening Prayer' (1860); 'Spring Flood' (1865); 'Shylock and Jessica' (1867); 'The Disciples at Emmaus' (1868); 'Yes or No?' (1873); 'Taming of the Shrew' (1874); 'Anne Page and Slender' (1875); 'Selecting Pictures for the Royal Academy Exhibition' (1876); 'Bianca's Lovers' (1877); and 'Faraway Thoughts' (1881). His etchings have also been much admired. He became A.R.A. in 1843 and R.A. in 1848. His 'Reminiscences' were published in 1891.

Cope, Edward Drinker, American zoologist and paleontologist: b. Philadelphia, Pa., 28 July 1840; d. there 12 April 1897. Oliver Cope came to this country from Wiltshire, England, about 1687, and settled on Naaman's Creek in the northernmost part of the State of Delaware. Oliver's grandson, Caleb, a member of the Society of Friends, was burgess of Lancaster, Pa., in 1776, and incurred the indignation of his fellow-townsmen for offering the hospitalities of his house to Capt. (afterward Major) André and other British prisoners captured at St. John's, Canada, by Gen. Montgomery. Caleb's son, Thomas Pim Cope, settled in Philadelphia, and established the Cope packet line, trading between that city and Liverpool. Thomas Pim Cope's son Alfred married Hannah Edge and was the father of the subject of this sketch.

During the first seven years of Edward's life he was educated at home, and gave early proofs of a restless inquisitiveness and an accuracy of reasoning on what he had observed, very rare in so young a child. Being taken on a voyage by sea from Philadelphia to Boston before he had reached his 7th year he kept a journal in which he recounted the incidents of his voyage and sojourn, amply and very creditably illustrated by sketches. At about the same time he made some visits to the museum of the Academy of Natural Sciences in Philadelphia, describing and sketching the objects he saw. At 13 he entered the Friends' School at Westtown, Chester County, Pa., where, though he devoted his leisure to the collection and observation of plants and small animals, he received better marks in mathematics, astronomy, Latin, etymology, grammar, Scripture, and chemistry, than in physiology, which formed so important a ground work for his subsequent researches. As a young man of 18 he announces to his family that he is to be a naturalist. His letters of this period disclose an undercurrent of gallantry, and some of his descriptions of natural scenes are really poetic; and indeed some not very bad versification still exists to prove that he was capable of fair rhyming.

His father tried to make a farmer of him, and for this purpose gave him a farm near Coatesville, Pa. He learned much of the flora and fauna of this region, but revolted at the thought of settling down to this monotonous life. He longed to grapple with the larger problems of biology, and broadly hints this in a letter of 1858: "Dr. Leidy is getting up a great work on comparative anatomy." . . . "Such a work will be very useful to those who want to go to the bottom of natural history; it is an interesting study, too, to notice the modification in form, the degradations, substitutions, etc., among the internal organs and bones. The structure, forms, and positions of the teeth, too, are interesting to notice, so invariably are they the index of the economy and the position in nature of the animal."

In 1859 he published his first paper on the 'Primary Division of the Salamandridæ.' He became a member of the Academy of Natural Sciences of Philadelphia in 1861. He had had his wish to attend Leidy's lectures, and this same year he spent some time with Gill, Kennicott, Meek, and Horatio Wood in the museums of the Smithsonian Institution at Washington. He greatly admired Profs. Henry, Baird, and Arnold Guyot. He was astounded that Guyot believed in the resurrection of the body. He published 6 scientific papers in 1860; 9 in 1861; 13 in 1862; 4 in 1863; 5 in 1864; 10 in 1865; 11 in 1866. These were almost exclusively printed in the 'Proceedings' of the Academy of Natural Sciences and were largely on herpetology. In 1866 he became a member of the American Philosophical Society, and thenceforward published largely in this society's proceedings. Altogether, counting his editorials in the 'American Naturalist,' and five posthumous publications, his life yielded 1,281 separate papers on scientific subjects. The following statement of his work is taken from Prof. Henry F. Osborn's article in 'Science' for 7 May 1897.

As early as 1868 he laid the foundations for five great lines of research on the following subjects: Fishes, Amphibians, Reptiles, Mammalia, and Philosophy. He unconsciously followed Lamarck in ascribing to conscious effort the adaptive changes in species, and this at the age of 28. In 1869 he struck the keynote of all his later evolution in the sentence, "intelligent choice may be regarded as the originator of the fittest, while natural selection is the tribunal to which all the results of accelerated growth are submitted." He accepted the term, Neo-Lamarckian as properly describing his position, which was that, while very many specific characters are adaptive, few generic characters are so, but these latter are the results of the acceleration or retardation of one plan of development predetermined by the Creator. As in the case of Huxley, Haeckel, and many other naturalists of the last century, his career started in zoology, but led inevitably to paleontology, as it always must with a man of research so broad of view. Osborn says Cope's work in ichthyology would alone have given him high rank among zoologists. Baur says no naturalist ever published so many papers on the taxonomy, morphology, and paleontology of the amphibia. His work on the Mammalia and Reptilia was immense. At the time of his death Cope had personally named and described 1,115 out of 3,200 known species of fossil vertebrates of North America, or 34.8 per cent.

In 1865 he married Miss Annie Pim, by whom he had one daughter, now the wife of Prof. William H. Collins of Haverford College, Pa. He was elected professor of natural science at Haverford College in 1864; was made a member of the National Academy of Science in 1872; received the Bigsby gold medal from the Geological Society of London in 1879; was elected to membership in the Imperial Society of Moscow in 1880; received the degree of Ph.D. from Heidelberg University on the occasion of the celebration of its 500th anniversary, and was elected professor of geology and paleontology at the University of Pennsylvania the same year. In 1891, on motion of Dr. Leidy, he was awarded the Hayden memorial medal. He was president of the American Society of Naturalists in 1895, and president-elect of the American Association for the Advancement of Science at the time of his death. For the titles and those of all of Prof. Cope's publications, see 'Catalogue chronologique des publications de E. D. Cope, Annales de la Société geologique de Belgique t. XXIX. Bibliographie, Liége, 1902'; and the 'Alphabetical Cross Reference Catalogue of the Works of E. D. Cope'; Memorias y Ravista de la Sociedad 'Antonio Alzate,' Mexico, 1902; both by Dr. Persifor Frazer.

PERSIFOR FRAZER.

Cope, Sir John, English general; d. 28 July 1760. Having been made a Knight of the Bath, in 1742 he commanded the troops sent to the assistance of Marie Theresa. On the landing of Prince Charles Edward in 1745, Cope was appointed commander-in-chief of the government forces in Scotland. After a fruitless march to the Highlands, he returned with his troops by sea to Dunbar, and on 21 September was totally defeated at Prestonpans. His defeat is celebrated in the Jacobite song, 'Hey, Johnnie Cope, are Ye Waukin' Yet?'

Cope, Thomas Pym, American merchant; b. Lancaster County, Pa., 20 Aug. 1768; d. Philadelphia, Pa., 22 Nov. 1854. He began importing goods in his own vessels in 1807, and in 1821 established the first line of packets between Philadelphia and Liverpool. He was held in great respect by his fellow-townsmen, who elected him to many places of trust and honor. During the yellow fever epidemic of 1793 he stayed in the city to aid its victims, and during the smallpox outbreak in 1797 carried food to the houses of those taken with the disease, and in other ways cared for them. He was an executor of Stephen Girard's will; secured the estate of Lemon Hill as a park for the city; and was active in the construction of the Pennsylvania Railroad. The introduction of the Philadelphia water supply from the Schuylkill and the establishment of the Mercantile Library were largely due to his efforts.

Cope, an article of ecclesiastical vesture in the Roman Catholic Church. It is a voluminous cloak reaching nearly to the feet, opening in front, and with a semicircular cape or hood behind. It is usually of silk material, embroidered, or of cloth of gold. It is worn by the celebrant in certain functions, as processions and benediction. The cope is not, like the chasuble (q.v.), reserved to priestly use; it is worn also in solemn processions by the clerics who attend the celebrant, and by the cantors in Church services.

Copeck, (Russian, "a lance"), a Russian copper coin, so called from the impression of St. George bearing a lance. The coin is the hundredth part of a silver ruble, or about the eightieth part of a paper ruble. It varies in value from three fifths to three fourths of a cent.

Copenhagen, kō-pĕn-hā'gĕn ("Merchants' Haven,") Denmark, the capital, situated on the shore of the island of Zealand, in the Sound, which is here about 12 miles broad; an outlying portion, Christianshavn, stands at the north end of the island of Amager or Amak, which is separated from Zealand by a narrow arm of the sea. The channel forms a fine large harbor, which is bridged over so as to connect Christianshavn and the main part of the city at two points. The fortifications on the land side have been removed since 1863; so that the city has now practically incorporated the suburbs Osterbro, Nörrebro, Vesterbro, and Frederiksberg. To counterbalance the expected injury to the city's commerce from the opening of the Baltic Canal, a great free port, free from customs dues, was constructed in 1890–4 to the north of the harbor. The business quarter stretches from the harbor in a northeasterly direction toward the principal and central square, Kongens Nytory, which in itself forms the focus of the life of the city. Farther north and east of this point lies the aristocratic quarter, with the handsome Amalienborg Square and its royal and ministerial palaces; this district is bounded in the extreme north by the citadel and the adjoining public gardens and walks on the shores of the Sound.

Among its few buildings of historical interest or intrinsic beauty, the Metropolitan Cathedral Church, known as Vor Frue Kirke, rebuilt after the bombardment in 1807, possesses statues of Christ and the apostles, and a baptismal font,

designed and in part executed by Thorwaldsen. Trinitatis-kirke is remarkable for its round tower, which is ascended by a winding causeway instead of steps; and Holmens' kirke contains interesting monuments to the great naval heroes, Juel and Tordenskjöld. An English church, built at a cost of $49,000, was consecrated in 1887. The royal palace, called Christiansborg, was rebuilt between 1794 and 1828, but was never remarkable for architectural beauty. The principal part of the vast building was destroyed by fire in 1884, when many precious works of art were destroyed. Happily most of the pictures in its great art gallery were saved. The castle of Rosenborg (1610–24), where the regalia are kept, contains interesting collections of objects of art; and the palace of Charlottenborg (1624), is now used as an academy of arts. Copenhagen is the centre, not only of Danish, but northern literature and art, and is the seat of a number of societies for the advancement of these in all their branches, among which are the Royal Society, founded in 1742; and the Royal Society of Northern Antiquaries, founded in 1825; as well as agricultural, geographical and other societies. The royal library contains over 500,000 volumes, besides great treasures of Sanskrit, and other MSS. The Museum of Northern Antiquities in Prindsens Palais, is unrivaled in its kind, having been made what it is mainly by Worsaae. The Thorwaldsen Museum, opened in 1846, consists of works of art by that sculptor himself, and others left by him to the Danish nation, for which a separate building has been erected. Copenhagen contains also a number of well-supported benevolent institutions, banks, theatres, an exchange, etc. There are statues of several of the Danish kings, of Tycho Brahè, and of the poets. The chief exports of Copenhagen are grain, rape-seed, butter, cheese, beef, cattle, wool, hides, bones, and grain-spirit. Porcelain, pianos, clocks, watches, mathematical instruments, chemicals, sugar, beer, and tobacco are manufactured.

About the middle of the 12th century Copenhagen was but a fishing village, in the neighborhood of which Bishop Axel, or Absalon, built a castle. In 1254 the village obtained the privileges of a town, and in 1443 King Christopher made it the capital of the kingdom. It was several times attacked by the Hanseatic League; was besieged by the Swedes in the 17th century; was bombarded by the English, Dutch, and Swedes in 1700; suffered grievously by fires in 1728, 1794, and 1795; witnessed a great sea-fight in its roads on 2 April 1801, when the English, under Sir Hyde Parker, with Nelson as his second in command, destroyed the Danish fleet; and (to prevent the Danish fleet from falling into the power of Napoleon), was bombarded by the English from the 2nd to the 5th of September 1807, when great destruction was wrought, both in houses and public buildings, and hundreds of persons lost their lives. In 1888 an international exhibition was held here. Pop. (1901) without suburbs, 378,235; with suburbs, 476,806.

Consult: 'Copenhagen, the Capital of Denmark.'

Copenhagen, University of, founded in 1478, by Christian I.; destroyed during the civil wars; rebuilt by Christian III. in 1539; destroyed by fire in 1728; rebuilt by Christian VI. in 1732, and organized as at present in 1788. This is the only university in Denmark and one of the best in the northern part of Europe. It is supported partly by the government and partly by endowment; instruction is free to both sexes. In 1902 there were enrolled 2,000 pupils, and the library contained 300,000 volumes. It possesses also a large collection of Persian MSS., another of Northern MSS. Connected with the university are a surgical academy, an observatory, a botanical garden, a zoological museum, and a polytechnic institution.

Copepoda, kō-pĕp'ō-da, an order of Crustacea, ranked under the sub-class *Entomostraca* and the legion *Lophyropoda*. They are animals of small size, seldom more than 1 cm. in length, with the body divided into two segments, namely, a cephalothorax and an abdomen. There are two pairs of antennæ, two pairs of footjaws, and five pairs of ordinary feet furnished with bristles and adapted for swimming. There is a jointed tail with a tuft of bristles at its extremity. Some are found in fresh water, others are marine. Prof. Huxley says that in addition to the species placed under copepoda by Latreille and Milne-Edwards, the order contains some of the *Epizoa* or *Ichthyophthira*. There are two families, the *Cyclopidæ*, which have but a single eye; and the *Cetochilidæ*, which have two eyes. Possibly a better division of the more than 1,000 genera of this order is into parasitic *Copepoda*, whose distinguishing mark is the mouth with which they suck blood (hence the name *Siphonostomata*), the independent *Copepoda* (*Gnathostomata*), and the false *Copepoda* or *Branchiura*. The English book-name of the *Copepoda* is oar-footed crustaceans, which is simply the rendering of the scientific name.

Copernicus, kō-pĕr'nĭ-kŭs, or **Koppernigk, Nicolas,** Polish astronomer: b. Thorn, Poland, 19 Feb. 1473; d. Frauenburg, East Prussia, 24 May 1543. His father was a Pole and his mother a German. From a school at Thorn Copernicus went to Cracow, where he studied medicine, theology, mathematics, and astronomy. The fame of Peurbach and Regiomontanus, the restorers of astronomy in Europe, excited his emulation. In 1496, at the age of 23, he went to Italy, and at Bologna resided two years, studying canon law and astronomy. In 1497, while in Italy, he was appointed a canon of the cathedral of Frauenburg. In 1500 he went to Rome, where he lectured on mathematics and astronomy. Subsequently he studied medicine at Padua, and canon law at Ferrara, where he graduated as doctor in this subject. He returned to Prussia in 1505, and lived for some years at Heilsberg, but his subsequent life was mostly spent at Frauenburg.

He now applied his whole strength to the study of astronomy, which at this time was dominated by the system of Claudius Ptolemy. Copernicus doubted whether the motions of the heavenly bodies could be so confused and so complicated as this hypothesis would make them. He found that some of the ancient Greeks had thought of the possibility of a motion of the earth. This induced him to examine the subject more fully, and he came to the following conclusions: That the sun was the centre of the system; that the earth was a planet like Mars and Venus; and that all the planets revolve

round the sun in the following order: Mercury in 87 days, Venus in 224, the Earth in 365, Mars in one year and 321 days, Jupiter in 11 years, and Saturn in 29 years. Although Copernicus knew that the planetary orbits are not circles having the sun in the centre, he was not able to determine exactly their form. This was reserved for Kepler, who completed what may be called the natural history of the subject, and stated his three celebrated laws in the end of the 16th century. Thus Copernicus stands, as it were, upon the boundary-line of a new era. He commences his labors at a time when the belief in the immobility of the earth is universal. He conceives the idea of its motion, and pursues it with unwearied diligence, not for a few years, but through the greater part of his life, constantly comparing it with the appearances in the heavens. He at last confirms his idea, and thus becomes the founder of a new system of astronomy. All this he did a hundred years before the invention of telescopes, with imperfect wooden instruments on which the lines were often only marked with ink. His great countryman, Kepler, has described his character in the following words: "Copernicus, vir maximo ingenio, et quod in hoc exercitio magni momenti est, animo liber." In his celebrated work, dedicated to the Pope, Paul III., "De Orbium celestium Revolutionibus," libri vi. (completed in 1530, although first published at Nuremberg 1543, folio; later editions appeared at Basel 1566, at Amsterdam 1617, at Warsaw in 1851, at Berlin in 1873), his system is developed.

Besides his principal work, we have also by him a work on trigonometry, 'De Lateribus et Angulis Triangulorum.' The first biography of Copernicus was written by the mathematician Gassendi (1654), and for 200 years this work served as the basis of all subsequent biographies of the great astronomer; but in more recent times the labors of Prowe and others have helped us to a better acquaintance with the facts of his life. Count Sierakowski erected a monument to his memory in St. Anne's Church at Cracow, with this inscription: "Sta, sol, ne moveare" (Stand, Sun, do not move). Thorwaldsen, one of the greatest sculptors of our time, executed a colossal statue of Copernicus for the city of Cracow, which is one of the noblest specimens of modern art. Another statue of his by F. Tieck has been erected to him in his native town. Consult Prowe, 'Life of Copernicus' (1883–4).

Cophas, kō'fas, a tribe of Indians who for hundreds of years had lived in Southern California, near Los Angeles, in a place now known as "Warner's Ranch." The Government Agricultural Commission appointed in the fifties to adjust the claims of the Indians and Mexicans, overlooked this tribe and their lands were sold without a hearing. They refused to leave their home, although it was a waste of poor soil, but in May 1901 the Supreme Court confirmed the rights of the white claimants. In May 1903 they were moved by the government to their new home, a fertile tract of land in the valley of Pala, on the San Luis Rey. The tribe numbers 300.

Cophetua, kō-fĕt'ū-a, an African king of legend and ballad verse who married the beggar maid, Penelophon. Shakespeare in alluding to Cophetua calls the maid Zenelophon. There is a well known poem by Tennyson on the subject. See Percy's 'Reliques.'

Copiapo, kō-pē-ä-pō', or San Francisco de la Selva, Chile, the capital of the province of Atacama, centre of an important mining district. Silver and copper are the chief minerals obtained, but gold also is found. There is a railway connecting it with its port, Caldera. In 1819 and 1822 it was destroyed by earthquakes; and in 1851 it was again seriously damaged. Pop. 10,000.

Copley, John Singleton, American painter: b. Boston, Mass., 3 July 1737; d. London, Eng., 9 Sept. 1815. His talent for drawing developed at an early age, and in 1769 he sent anonymously to Benjamin West in England a portrait called 'The Boy and the Flying Squirrel,' which, when exhibited, was highly praised by the best English artists of the time. In 1774 he sailed for England, visited Italy, and settled in London, where he rose rapidly in popularity as a portrait painter, within a few years being elected an associate member and full member of the Royal Academy. Some of his most celebrated paintings are portraits of the English royal family; the 'Death of Lord Chatham,' now in the London National Gallery; 'Siege and Relief of Gibraltar,' in the council chamber of the Guildhall; 'Major Pierson's Death on the Isle of Jersey'; 'Surrender of Admiral De Winter to Lord Duncan'; 'Charles I. Demanding the Five Impeached Members in the House of Commons'; 'The Red Cross Knight'; 'Mrs. Derby as St. Cecilia.' His son, Lord Chancellor Lyndhurst, made a notable collection of his father's works, which was dispersed at public sale in 1804. Consult Perkins, 'Life of J. S. Copley' (1873); Amory, 'Life of J. S. Copley' (1882).

Copley, John Singleton (1772–1863). See LYNDHURST, BARON.

Coppée, François Édouard Joachim, frän swa ā-dood-är zhō-ä-chĭn kŏp-pā, French poet and dramatist: b. Paris 12 Jan. 1842. He was educated at the Lycée St. Louis; has been librarian of the Senate, and keeper of the Records at the Comédie Française 1878–84. He was a member of the French Academy in 1884, and an officer of the Legion of Honor in 1888. Chief among his plays are: 'Le passant' (1869); 'Fais ce que dois' (1871); 'Le luthier de Crémorne' (1877); 'La guerre de cent ans' (with d'Artois) (1878); 'Madame de Maintenon' (1881); 'Severo Torelli' (1883); 'Les Jacobites' (1885). An edition of his dramas in four volumes appeared (1873–86). Among his volumes of poems may be named: 'Le reliquaire' (1866); 'Les intimités' (1868); 'Poèmes modernes' (1869); 'Les humbles' (1872); 'Le cahier rouge' (1873); 'Olivier' (1874); 'Une idylle pendant le siège' (1875); 'L' exilée' (1876); 'Les mois' (1877); 'Le naufrage' (1878). He has also published a collection of essays 'Mon franc parler' (1894). Consult Claretie, 'François Coppée'; Lescure, 'F. Coppée, L'homme, la vie l'œuvre' (1880).

Coppée, Henry, American educator: b. Savannah, Ga., 13 Oct. 1821; d. Bethlehem, Pa., 21 March 1895. He served in the Mexican War (1846–8); was instructor at West Point (1848–9, 1850–5); professor of English lit-

erature and history at the University of Pennsylvania (1855–6); president of Lehigh University (1866–75); and professor of history there (1875–95). Besides various educational and military works, he wrote: 'Grant and His Campaigns' (1866); 'History of the Conquest of Spain by the Arab-Moors' (1881).

Copper, a metallic element occurring abundantly in nature, and widely used in the arts, both in the pure state, and as an essential constituent of many alloys. It has been known from the earliest times, and is frequently mentioned by the ancient writers. Prehistoric weapons, tools, and ornaments of copper, as well as domestic implements, remain in profusion to this day; and it has been commonly asserted that copper was known and used before iron, though some authorities consider the evidence of this to be inconclusive. The Romans obtained their best copper from Cyprus, an island in the Mediterranean Sea, and for this reason the metal was known as *Cyprium æs,* or "Cyprian brass," a name that was later contracted to *cuprum* and *cuper.*

Physical Properties.— Copper is red in color, and crystallizes in cubes, octahedra, and other forms of the isometric system, twinned crystals being quite common. When in a finely divided condition it has a specific gravity of about 8.36; but the specific gravity of native copper is 8.84, and that of hammered or electrically deposited copper is about 8.95. It melts at about 2,000° F., and has a specific heat of about 0.093, and a coefficient of linear expansion of about 0.0000092, per Fahrenheit degree. Its tensile strength varies greatly, according to the physical condition of the metal. The following data are commonly used in engineering practice, as corresponding to the tensile strength in pounds, per square inch of sectional area: Cast copper, 19,000; sheet copper, 30,000; copper bolts, 36,000; copper wire, 60,000. The thermal conductivity of copper, at ordinary temperatures, is about 0.74 times that of silver. The specific electrical resistance of hard-drawn copper is 1,620 ohms, and that of annealed copper is 1,584 ohms. A wire of the metal that is one metre long and one millimetre in diameter has a resistance of 0.0206 ohms if hard drawn, and 0.0202 if annealed. These data are for the pure metal, at the temperature of freezing water. The electrical resistance of copper increases by about 0.388 of one per cent for each Centigrade degree of rise of temperature. The electrical resistance is also greatly increased by the presence of small percentages of iron, zinc, tin, phosphorus, or arsenic, and hence great attention is paid to the purity of the copper that is intended for use in electrical conductors. Copper is very malleable and ductile, and may be drawn into small wire and hammered into exceedingly thin sheets. An alloy consisting of 11 parts of copper and 2 of zinc is even more malleable than copper itself, and may be hammered into foil comparable in appearance with gold-leaf, for which it is used as a substitute in certain kinds of work, under the name of "Dutch metal." Copper becomes very soft and malleable when it is strongly heated and immediately immersed in cold water, its behavior under these circumstances being diametrically opposed to that of steel. It may be forged into any shape, but it will not bear more than a red heat, since it becomes brittle at higher temperatures. It does not oxidize readily under ordinary conditions, but becomes superficially tarnished with a coating of carbonate that resists the subsequent action of the oxygen of the air. Copper often gives poor castings, apparently because the molten metal absorbs gases, and these, when given off again at the moment of solidification, make the casting porous. The castings are said to be much more sound when a small quantity of phosphorus is added to the molten metal — usually in the form of phosphor-copper. The large copper cylinders that are used in calico-printing are cast in molds, and are subsequently hammered under a steam-hammer until the metal is sound, and then turned down in a lathe until the surface is true and free from defects.

Alloys.— Many alloys of copper are used in the arts, chiefly under the name of "brasses" or "bronzes." Originally a brass was defined as an alloy of copper and zinc, while a bronze was defined as an alloy of copper and tin. This convention is still retained in a general way, but the same names are applied also, and very commonly, to numerous ternary alloys, containing copper, zinc, and tin, which pass by insensible gradations from a true brass to a true bronze; so that "brass" and "bronze" can no longer be regarded as very definite terms. Alloys of copper with aluminum are called "bronzes," even when no tin is present. See Alloy.

Chemistry.— The chemical symbol for copper is Cu (*cuprum*), and the atomic weight of the metal is 63.1 if H = 1, and 63.6 if O = 16. Copper forms two distinct series of salts, known respectively as "cuprous" and "cupric" compounds. In the cupric series the metal is a dyad, while in the cuprous series it enters into the ordinary formulæ as though it were a dyad (see Valency). Structural formulæ have been given, however, which indicate that the metal is really a dyad in both cases. The cupric series of salts embraces those compounds that are most familiar in the arts. Cupric oxide (known also as copper monoxide, or black oxide) is formed when metallic copper is heated in the presence of air. It may occur as a brownish-black amorphous powder, or in lustrous monoclinic crystals. Cupric oxide is used in the laboratory for effecting the combustion of organic substances, the oxide being intimately mixed with the body to be oxidized, and the whole raised to a red heat, at which temperature the cupric oxide readily gives up its oxygen to either hydrogen or carbon. Cupric oxide (the formula of which is CuO) is soluble in acids, and yields, with them, salts which crystallize well. If a solution of any of these salts be made alkaline by the addition of a caustic alkali, a light blue precipitate of cupric hydrate, $Cu(OH)_2$, is thrown down. Upon heating to 212° F., this parts with a molecule of water and becomes reduced to the black oxide, CuO. If cupric hydrate be precipitated by adding the calculated quantity of sodium hydrate to a solution of copper sulphate, and the precipitate is washed and dissolved in ammonium hydrate, a blue solution is obtained, which is sometimes called "cupro-ammonium hydroxin," and which possesses the singular power of dissolving cellulose (q.v.) without chemical change. When pure cupric oxide is desired, it is most conveniently prepared by heating cupric nitrate to redness. Cupric nitrate is readily prepared by dissolving metallic copper in nitric acid. It crys-

tallizes in large blue prisms, having the composition $Cu(NO_3)_2 + 6H_2O$. Ordinary copper sulphate (cupric sulphate, or "blue vitriol") is manufactured in large quantities by dissolving scales of copper oxide (CuO) in sulphuric acid. It forms large blue triclinic crystals, which have the composition $CuSO_4 + 5H_2O$. The sulphate is used in calico-printing, and in the manufacture of various copper pigments such as Brunswick green and Scheele's green. Cupric chloride, $CuCl_2$, is formed by dissolving cupric oxide in hydrochloric acid, or by acting upon metallic copper by chlorine gas. It is soluble in alcohol or water, and forms acicular crystals having the formula $CuCl_2 + 2H_2O$. Cupric sulphide, CuS, is the familiar black precipitate that is obtained when sulphuretted hydrogen gas is passed through an acid solution of a copper salt (see CHEMICAL ANALYSIS). Copper carbonate, $CuCO_3$, has not been prepared in the pure state, but a green precipitate having the formula $CuCO_3 + Cu(OH)_2$ is thrown down when carbonate of potassium or of sodium is added to a solution of a copper salt; this precipitate being identical in composition with the mineral malachite. Cuprous oxide, Cu_2O, or red oxide of copper, occurs native in red octahedral crystals, and it may also be prepared artificially by heating a mixture composed of equivalent parts of cupric oxide and finely divided metallic copper, or (more conveniently) by heating a mixture of equal parts of cupric oxide and ammonium carbonate, $(NH_4)_2CO_3$, over a Bunsen burner, until all the ammonia is expelled. It is a crystalline powder of a carmine color, melting at a strong red heat, and is used in glass manufacture for the production of a ruby color. The precipitation of this oxide from certain test-solutions is used as a test for the presence of sugar in urine (see URINARY ANALYSIS). Cuprous oxide dissolves in various acids with the production of colorless salts, which are unstable, since they readily absorb oxygen and pass into the corresponding cupric salts. The most important cuprous salt is the chloride, which has the formula Cu_2Cl_2, and is formed by heating metallic copper to dull redness in a current of hydrochloric acid gas, or by dissolving a mixture of cupric oxide and metallic copper in hot hydrochloric acid. It is a white crystalline powder, insoluble in water or alcohol, or in dilute nitric or sulphuric acids, but dissolving in ammonia, or in hot hydrochloric acid. Its solution in either of these menstrua possesses the remarkable property of absorbing carbon monoxide gas. Copper may be detected in solution (1) by the formation of the black sulphide when a stream of sulphuretted hydrogen gas is passed through the acidified solution; (2) by the precipitation of the blue hydroxide, which blackens upon heating; (3) by the deep blue color that its salts give upon the addition of ammonia; and (4) by the precipitation of a red film of metallic copper when a clean, bright fragment of iron is immersed in the solution.

Physiological Action.—In medicine, salts of copper are used as astringents and as antiseptics, copper sulphate being the favorite salt. The soluble salts of copper are all exceedingly poisonous, and since the metal is very widely used in the arts, copper poisoning is quite common. In acute poisoning the symptoms are those of an acute gastro intestinal irritant. These usually develop in from 10 to 20 minutes, though they may be delayed as much as two or three hours. There is nausea and vomiting of bluish material, accompanied by a metallic taste in the mouth, and intense burning in the stomach, with great abdominal tenderness. If all the copper is ejected by the emesis, the patient usually recovers. This is usually the case, but sometimes, when the dose is extremely large, vomiting is ineffectual. In addition to the symptoms already given, intense headache then develops, accompanied by great prostration and cramps, with small, rapid pulse, and collapse: death sometimes following in from 4 to 12 hours, but more commonly after two to four days or more.

World's Output of Copper.—The United States produces far more copper than any other country, its present output being, in fact, about 55 per cent of that of the entire world. Spain and Portugal (combined production) come next, and then Japan, Chile, Australasia, Mexico, and Germany. The total production of copper for the year 1900 is given in the accompanying table.

WORLD'S PRODUCTION OF COPPER IN 1900.

Country	Long Tons	Country	Long Tons
Argentina	75	Mexico	22,119
Australasia	23,000	Newfoundland	2,883
Austria-Hungary	1,355	Norway	3,035
Bolivia	2,100	Russia	8,000
Canada	8,459	Peru	8,220
Cape Colony	6,720	Spain-Portugal	52,872
Chile	25,604	Sweden	450
Germany	20,310	Turkey	2,304
Italy	2,753	United Kingdom	765
Japan	27,840	United States	268,229
		Total	487,093

WORLD'S PRODUCTION OF COPPER IN 1902.

United States	(Long Tons.) Foreign	Total	Percentage of U. S.
294,297	247,870	542,167	.54

WORLD'S PRODUCTION OF COPPER IN 1903.

(Long Tons.)
581,000 (Estimated)

PRODUCTION OF NATIVE COPPER BY LAKE SUPERIOR OR MICHIGAN MINES IN 1903.

192,299,191 (Pounds Avoirdupois)

Copper Mines of the United States. Copper ore was mined in colonial times in Connecticut, New Jersey, Pennsylvania, and Maryland. The first mine opened was the Schuyler mine, near Arlington, N. J., discovered in 1719, and worked at irregular intervals for a long period. Few of the early mines were steady producers, and copper mining on a large scale in the United States did not begin until after the discovery of the great deposits of native copper on Keweenaw Point, Mich., and the adjacent mainland. The first important Lake Superior mine was the Cliff, which began shipping in 1846, followed by the Minnesota, in 1847, and then by the Central, Phœnix, National, and others. These mines, except the Minnesota, recently reopened, are now exhausted and idle. In 1864 the Calumet lode was discovered, and in 1866 the Calumet mine, consolidated with the Hecla in 1871 as the Calumet and Hecla, began its wonderful career. Between 1870 and 1892 this mine made more than half the output of Michigan, reaching a maximum in 1898 of 98,002,137 pounds of refined metal, and was for

years the largest copper producer in the world. On a capitalization of $2,500,000, a part of which was not paid in, the Calumet & Hecla Mining Company has distributed over $86,350,000 in dividends and made over $243,000,000 worth of copper. The deepest vertical shaft is down 4,920 feet, but another mine, the Tamarack, also working the Calumet lode, has a vertical shaft down 5,027 feet, the deepest in the world. Still another famous mine, the Quincy, working by inclined shafts a different lode, has reached a vertical depth of 4,008 feet. Two other noted concerns are the Osceola Consolidated, working a group of mines, and the Copper Range Consolidated, controlling the Baltic, Champion, and Trimountain mines. In 1903 Michigan mines made 15 per cent of the copper output of the world.

Michigan took second place when the series of fissures and cross-fissures, carrying copper and some silver, were developed near Butte, Mont. The most famous of the Butte mines, the Anaconda, opened as a silver mine in 1880, struck immense bodies of sulphides carrying over 50 per cent copper, and quickly became the world's largest copper producer. In 1899 it yielded 107,014,357 pounds of the metal and has paid many millions in dividends. The deepest shaft is 2,300 feet. The total ore output of the Boston & Montana mines, also at Butte, exceeded that of the Anaconda in 1903. Other large producers are controlled by the Montana Ore Purchasing Company and by W. A. Clark. The output of all Butte mines in 1900 was 254,000,000 pounds of refined copper. Arizona ranks third as a copper producer, but has greater possibilities than Montana. There are three important districts — near Bisbee, in Cochise County; near Jerome, in Yavapai County; and near Morenci and Clifton, in Graham County. At Bisbee is the famous Copper Queen Consolidated Mining Company, which in 1903 won some 37,000,000 pounds of copper from its huge bodies of carbonate and sulphide ores. The Calumet & Arizona and Lake Superior & Pittsburg are successfully working in the same formation. At Jerome the United Verde mine has great sulphide deposits that carry enough gold and silver to pay most of the mining and reduction charges. In the Morenci-Clifton district, the Detroit Copper Company, the Arizona Copper Company, and the Shannon Copper Company are large producers, from immense, but lean, deposits. California, Utah, and Colorado are important copper-producing States. The largest California mines, worked by the Mountain Copper Company and the Bully Hill Copper Mining and Smelting Company, are in Shasta County. In Utah there has been much development in the Bingham district, Salt Lake County. The largest mine, the Highland Boy, is owned by the Utah Consolidated Company. Its ores carry gold. The Bingham Consolidated and the United States companies are producers of note.

The largest concern mining copper east of Michigan is the Tennessee Copper Company, at Ducktown, Tenn., where, also, the Ducktown Sulphur, Copper and Iron Company is working. Efforts to work deposits at Vershire, Vt., have been more or less successful. Mines in North Carolina have attracted attention, and at intervals copper is mined in New Jersey.

Ores of Copper.—The copper obtained in the Lake Superior region is practically all in the metallic form, occurring in masses that vary in size from sand to large masses weighing tons. The largest mass of native copper yet found was discovered there in February 1857, in the Minnesota mine. It was 45 feet long, 22 feet wide at the widest point, had a maximum thickness of 8 feet, was about 90 per cent copper, and weighed something like 420 tons. In the Montana region the metal occurs mostly in the forms of sulphides, passing through all gradations from chalcocite to chalcopyrite, with considerable quantities of bornite. The mines are mostly confined to a small area two miles long by one mile wide, in the vicinity of Butte; and the actual yield of the average ore at this point, after making allowance for the losses incident to concentration and smelting, is about 100 pounds of copper and 4 ounces of silver, per ton of 2,000 pounds. In Arizona the principal ores are cuprite, malachite, azurite, and chalcocite. Chalcocite (known also as "vitreous copper," or "copper glance") is of a leaden-gray color, and has the composition Cu_2S. It has a specific gravity of about 5.6, and contains (when pure) 79.8 parts of copper to 20.2 of sulphur. Bornite, erubescite, or purple copper, Cu_3FeS_3, has a specific gravity of from 4.8 to 5.4, and is brownish-red in color, often with an iridescent tarnish, in which blue is apt to predominate. Chalcopyrite, yellow copper ore, or copper pyrites, has a specific gravity of about 4.2, and a composition as indicated by the formula $CuFeS_2$. It occurs in various shades of yellow, often with a lively iridescence. When pure it contains 34.5 parts of copper to 30.5 of iron and 35.0 of sulphur. Cuprite, or red oxide of copper, Cu_2O, is commonly red in color, with an adamantine luster; but it is sometimes leaden gray, with a submetallic luster. It has a specific gravity of from 5.8 to 6.2, and, when pure, contains, 88.8 parts of copper to 11.2 of oxygen. Azurite, blue carbonate of copper, or chessylite, has the formula $2CuCO_3.Cu(OH)_2$, and is azure blue in color. When pure it contains 69.2 parts of cupric oxide to 25.6 of carbon dioxide and 5.2 of water. Malachite, or green carbonate of copper, is green in color, and has the formula $CuCO_3.Cu(OH)_2$.

PRINCIPAL COPPER MINES OF UNITED STATES.

Anaconda	93,500,000
Boston and Montana	90,750,000
Calumet and Hecla	76,490,869
Copper Queen	36,885,000
Arizona Copper Company	30,821,842
Montana Ore Purchasing Company	29,898,980
Calumet and Arizona	25,535,857

Copper, the Discovery of Native. Copper in a metallic form occurs, either alone or in connection with chemical combinations of the same metal, in many parts of the earth, notably in Chile and neighboring countries, in Alaska, in parts of South Australia, and more sparingly in Siberia, in Cornwall, in Germany, in several of the United States, and elsewhere. Nowhere, however, has it been found in quantities as large, or under circumstances as favorable for exploitation by itself alone, as in the Lake Superior region. The attention of the early navigators to America, next to the finding of a northwest passage to Asia, was directed to the natural resources of the New World, and especially to its deposits of gold and other minerals.

Of early references to copper in North America that of Verrazzano in 1524 is among

the first. He saw, on the coast of New England, boatstones of that metal in the ears of the natives. In 1535 Jacques Cartier, on his second voyage to the Saint Lawrence River, was told by the Indians that native copper — *cuyvre rouge* — by them called "caignetdaze," came from the Northwest, from the region known to them as Saguenay, and they gave to their chief, Donnacona, when he sailed for France with Cartier, a large knife of that metal.

In 1610, Champlain, on one of his excursions up the Saint Lawrence, is said to have been given a piece of copper a foot long, that was reported to have come from the bank of a river near a great lake. "The Indians asserted that it was gathered in lumps, and, after having melted it, they spread it in sheets, smoothing it with stones."

On Champlain's map of 1632 we find in a lake northwest of Lake Huron an island marked "where there is a mine of copper." This might have been either Michipicoten Island or Isle Royale.

Sagard, who published his 'History of Canada' in 1636, wrote that Brulé, one of Champlain's interpreters, showed him a "lingot" of copper which had come from a mine 80 or 100 leagues from the Hurons.

In 1660 Pierre Esprit Radisson, probably the first white man to explore the shores of Lake Superior, was led by an Indian companion to a place near the banks of a small stream that flows into the lake east of the Pictured Rocks, where he saw "many pieces of copper uncovered," and was told that a mountain near by was "nothing else." As this spot is outside of the area of the copper-bearing rocks the copper was either "float" or had been hidden there by the Indians. Radisson was also told that an island at the end of Keweenaw Point (Manitou Island?) was "all of copper."

In the Jesuit 'Relations' of 1659–60 it is said that an Indian reported copper from Lake Superior in pieces as large as one's fist. In the 'Relations' of 1666–8 Father Allouez reported pieces of true red copper from an island in Lake Superior, which, according to his description, was probably Isle Royale.

In the 'Relations' of 1669–71 Father Dablon reports red copper from the Ontonagon River, concerning which he says opinions differed as to where it was actually found; and also from the end of Keweenaw Point — the latter place being an islet "which appears to be six feet square, and is said to be all copper." This sounds like the report made to Radisson, except that no size was given to Radisson's islands, whose distance from the mainland corresponds with that of Manitou Island. The Jesuit Fathers were also assured by the Indians that in the interior to the south of Lake Superior "mines" of copper were found in different places. This report might possibly have some significance in connection with the so-called pre-historic miners, if the term *mine* had been used by the Jesuit Fathers with the meaning usually attached to it to-day, as something *in esse* rather than *in posse* — a rock formation carrying a workable deposit of mineral, rather than an isolated mass, one that had been removed to a distance from the parent bed. We know that the term was used loosely by later writers, even in the first half of the 19th century. H. R. Schoolcraft in 1821, when referring to the celebrated copper mass on the Ontonagon River, speaks of it as a mine.

With the exception of the "islet" referred to by Dablon which was possibly a piece of mass copper projecting out of the water at a shallow spot near the shore, all of the copper found as late even as the latter half of the eighteenth century appears to have been "float," that is, masses of smaller or larger size that had been transported from their original beds, generally by glacial action. Indeed it was this fact that probably explains the statement of Captain Jonathan Carver in 1778 that the copper itself costs nothing.

The area of "float" copper appears to have extended much beyond the territory immediately tributary to Lake Superior, for in 1700 Le Sueur found pieces of it near the mouth of the Chippewa River and another about four leagues above the mouth of the Saint Croix River, in Wisconsin. In later years similar finds have been reported as far south as Indiana and Illinois. But while Lake Superior was supposed to be the source of this copper we do not find any evidence that any white man — except always Father Hennepin — had ever seen anything that could be called a copper mine (sic), as early as the time of Charlevoix. The latter in his history of New France, published in 1744, says "It is certain that there has been discovered in several places a considerable quantity of this metal, without even being obliged to dig much." It is true that La Hontan early in the eighteenth century speaks of copper mines on Lake Superior, but he does not claim, like Hennepin, to have seen them. We also find many references to copper "mines" in the interior as reported by the Indians, who usually showed great reluctance to disclose their whereabouts to the white man.

Thus far the pieces of native copper found on Lake Superior were gathered on the edges of the islands and on the borders of the lake along the highways of navigation by canoe. It was not until 1765 that Alexander Henry, attracted by Indian reports of a large mass of copper, the one referred to by Dablon, visited the Ontonagon River and went up that stream several miles above the junction of the East and West Branches. He found, on a clay bank, at or near the edge of the stream, the copper mass, with some rock adhering to it through which ran small veins of copper. In 1771, revisiting the same place, he noticed also much copper bedded in stone, and left a party of miners there, "to make a trial on the hill, till we were better able to go to work on the solid rock." They dug 40 feet into the clay bank and found frequent masses of copper. All went well during the winter, but when spring came, the clay thawed and caved in, and the party left. In recording the above facts, Henry added that "The copper ores of Lake Superior can never be profitably sought for but for local consumption. The country must be cultivated, and peopled, before they can deserve notice." In a footnote to the above, having in mind the more roseate view then recently expressed by Alexander Mackenzie and earlier by Captain Carver, he adds, "The copper mines of Lake Superior have been more than once represented to the world in colors capable of deceiving fresh adventurers:

and the statement in the text will not have been uselessly made, if it should at any time serve as a beacon to the unwary." The fame of Henry's operations was probably spread abroad at the time, although his book was not published until 1809.

Henry's visit to the Ontonagon River marks the culmination of the efforts of two and a half centuries of search for the original source of the Lake Superior native copper — its location in the rocks of volcanic origin that almost surround that inland sea. It also marks the beginning of an industry that in spite of Henry's warning has grown to be one of the most important of the northwest. Possibly the troubles that distracted the country during two wars, and the boundary disputes in the region of the Great Lakes, rather than the adverse sentiment caused by Alexander Henry's failure, kept back the development of the copper district of Michigan, but the spirit of expansion which during the administration of Jefferson found expression in the expeditions of Lewis and Clark and of Pike, later found an echo in Governor Lewis Cass, at whose initiative and under whose personal leadership an expedition to the northwest was effected in 1820, one of the objects of which was to investigate the copper "mines" of Lake Superior. Henry R. Schoolcraft accompanied this expedition as mineralogist. They visited the Ontonagon copper mass, which Schoolcraft recognized as having been removed from its original bed of "serpentine" rock; from which circumstance he inferred that there must be extensive "mines" in the vicinity.

In 1832 Schoolcraft, this time with Dr. Douglass Houghton as geologist to the party, again visited the Ontonagon River and the famous copper mass. On the way thither Dr. Houghton found copper embedded in the trap rocks on the western side of Keweenaw Point, and expressed the opinion that the "trap rock formation was the original source of the masses of copper," and that copper would probably not be found in that region in any other rock than trap, which Dr. Houghton at that time had seen only on Keweenaw Point.

During 1832 and 1833 Dr. Houghton visited the south shore of Lake Superior three times. Five years later he was appointed State Geologist of Michigan and before his death, in 1845, had carefully examined the copper-bearing formations, had ascertained their attitude and extent, had located a number of copper veins and had given to the world enough information to attract at once a large body of prospectors. The interest thus stimulated in the Michigan copper district soon led to the opening of some of its most famous mines. The success of this new industry, as predicted by Captain Carver, was soon assured by the building of the canal at Sault Ste. Marie, which afforded the products of upper Michigan cheap transportation from the wilderness to market.

Geology.—The "trap" rocks that constitute the greater part of the Lake Superior copper-bearing formations are a series of old lava flows which at one time may have completely lined the shores of that lake. Along the eastern shore remnants of these rock formations are still found at isolated points, but even remnants are now wanting on the south shore east of Keweenaw Bay. West of the latter point, all around the western end of the lake through Michigan, Wisconsin and Minnesota, the trap beds extend for several miles in width, striking nearly parallel with the general trend of the shore line, and dipping always towards the lake, the dip being usually flatter near the shore than it is further back. Associated with these trap beds occur beds of reddish conglomerate or sandstone at different intervals, composed of the debris of the former, or rather in most cases, of the debris of rocks more acid than the strictly so-called traps — rocks of granitic and felsitic habitus, whose greater resistance to erosion has enabled them to survive, in cases where the softer trap or melaphyre rocks have been ground up to the consistency of sand.

The alternation of beds of melaphyre, and of felsitic conglomerate, in parallel layers, records the history of past geological ages — on the one hand the quiet outflow of streams or sheets of molten rock-matter, towards or into a sea, during periods of volcanic activity, and on the other the no less quiet but slow and constant disintegrating action of the elements on the rocky barriers around the margins of this sea, the gradual breaking down of the rock masses, the transportation and rounding off of their fragments and the final consolidation of these into beds, of which at least one reaches the enormous thickness of twenty-five hundred feet.

On the extrusion and flow of lava which has been under pressure, the pent-up gases in it expand near the surface of the flow like the bubbles in a glass of champagne, and as the surface of the flow rapidly congeals, each gas bubble forms a cavity or amygdule. In the scoriaceous or amygdaloidal portions of the lava beds, which are thus characteristic of the upper surface of the bed, though sometimes found at the bottom — also in cavities caused by chemical changes or by fractures, and occasionally in the conglomerates — are frequently found the deposits of native copper that characterize these formations. At different angles to the strike of these beds fissure veins of later age are found, several of which, notably the Cliff, Phœnix and Central, proved also to be rich in copper, which in the Cliff mine carried with it a large amount of silver. The copper, possibly derived from sulphides during the oxidation of iron protoxide, occurs either in minute flakes, or in more compact bodies from the size of a pin head or less to masses of five hundred tons or more in weight, of shapes rounded like a boulder or branching irregularly — anastomosing — through the parent rock-mass. Large masses seldom occur in the conglomerates, but in these beds individual boulders are often found entirely replaced by copper. In the early days of mining here it was the fissure veins that were sought and worked almost exclusively. They produced a large amount of mass in a small area of ground, and this could be made marketable without the expense of treatment in a stamp mill. By the time the fissure veins were beginning to show signs of exhaustion the amygdaloid deposits came more into notice and soon proved that while they were less rich than the veins, volume for volume, they were much more extensive, and with the progress in mining methods, would probably prove profitable if worked on a large scale. The substitution of air drills for hand drills and of high explosives for black

powder helped to confirm this promise. Meanwhile the discovery of the Calumet conglomerate with its wealth of native copper had been made. As work on the fissure veins was gradually being developed, the lodes were in popular parlance grouped into two classes — amygdaloids and conglomerates. To-day, however, it is apparent that all so-called amygdaloid copper deposits are not properly so named and a further division is possible. Throughout the formations, especially along the upper surfaces of conglomerate beds, planes of weakness have existed along which there has been more or less movement of the overlying formations. These planes of weakness not infrequently coincide with the amygdaloidal upper portions of the trap beds, both in strike and dip, and shearing movements along them have fractured the rock to so great an extent as to form a veritable breccia, in which copper was later deposited in workable quantities. Indeed the copper often occupies the interstices in these breccia beds, while the amygdules of the rock composing the breccia are entirely filled with minerals other than copper. In a case of this kind the term "amygdaloid" deposit, if not confusing, is at least inexact. Such a deposit might better be called a "conformable vein" deposit. In some cases the zone of fracture does not quite coincide with the plane of the neighboring beds, but seen in plan is in the form of an arc, curving and dipping towards the underlying beds, until it meets one whose resistance to shearing was great enough to prevent its fracture. In such cases the copper deposit of the fractured zone may cease at or near the junction with the harder bed or may continue along the upper surface of the latter. Examples of this kind are found at the Michigan and Norwich mines.

Exploration.— The greater part of the area underlain by the copper-bearing formations of Lake Superior rises to an elevation of from 400 to 700 feet above the lake. Several ridges stand out above this general plateau whose summits show naked rock, and even in the lower ground there are some exposures of rock in place, but over a large area there is a heavy covering of "drift" — sand, gravel, and boulders — which completely conceals the rock surface and renders difficult a successful search for mineral. When mining operations began on Keweenaw Point the attention of the early prospectors was attracted by grooved stone hammers, some of which weighed as much as 30 pounds, generally found on the ridges, in or by the side of shallow excavations that showed copper embedded in the rock. These traces of crude mining by a former generation evidently served as a guide to the early white miners in locating the most prominent deposits. The ridges naturally consist of the hardest rock — the massive trap beds that have resisted erosion better than the softer amygdaloids. By following these ridges the early prospectors located the fissure veins, and with them some quasi fissure veins that ran parallel with the formation and contained large masses of copper, rough prongs of which projected above the rock surface. A "conformable vein" or an amygdaloid deposit thus located would be followed for miles, until perhaps it disappeared beneath a covering of drift. Sometimes a large block of cupriferous rock would be found, whose angularity indicated its probable nearness to the parent bed. Surmising the direction of the glacial movement the prospector would dig a series of trenches or *costeams* at right angles to the strike of the formation, on the side whence the glacial movement was supposed to have come. But here again in early days the fact was not recognized that Keweenaw Point had been the scene of glacial movements from at least two directions, and thus in one well-known instance explorations were vainly made in the wrong direction from the blocks of rich float-rock.

With the progress of geological investigation it was realized that the conglomerates interbedded with the traps and representing old sea beaches were more or less continuous around the ancient basin. Their character, it is true, does not remain constant from point to point, for this depends in a great measure upon the rocks that lay behind them during the process of their formation. They furnished reliable aid to correlation, however, and could be followed and recognized for long distances even across drift-covered areas. The lava beds, on the other hand, from their broad general similarity, usually were not safe guides. In some cases, however, even these could be identified over long distances by some marked peculiarity. If a workable copper deposit was known to exist near one of these conglomerates or near a recognizable trap bed, the latter was traced out and a pit or trench was then dug at a known distance from it equivalent to the distance of that bed from the copper-bearing bed at the place where the latter was last seen, allowance being made for ascertainable changes in the dip of the formation between the two places. In this way the Baltic lode of the Champion Mine was located about three miles from the Baltic Mine, although in the intervening distance the strike of the formation had changed 34 degrees. By taking the great Greenstone ridge in Keweenaw County as a guide the position of the northward extension of the Kearsarge amygdaloid bed was in a similar manner approximately ascertained about six miles from the nearest point at which it had been previously opened. While trenching was in progress to uncover this bed, the recognition of an isolated outcrop of its footwall — a very characteristic rock — pointed more exactly to the location of the amygdaloid. Exact calculations are not always possible, for the dip of the beds from younger to older may change — commonly does change — and can seldom be determined for any one place, in advance of mining. The diamond drill is often an important aid in cases like the above, where the thickness of the drift-covering makes trenching impossible or too expensive.

Development.— A mere deposit of mineral or an isolated mass is not necessarily synonymous with a "mine," as previously remarked. As now frequently understood, a "mine" is a deposit sufficiently exploited to afford reasonable hopes that it can be worked at a profit. To ascertain whether a native deposit of copper in Michigan will pay requires a good deal of time and the expenditure of a large amount of money. Shafts must be sunk, generally, in the lode to test the latter continually in depth, and drifts must be driven from the shafts at different distances from the surface, to show the lateral extent of the deposit, its uniformity and richness.

If the rock mined carries from one to two per cent of fine copper, or from twenty to forty pounds per ton, and the lode is ten feet or more wide, the management knows that by mining on a large scale the costs can be brought down to a paying basis with copper at about twelve cents a pound. Some mines with wide deposits can make a handsome profit at the last named price. In the exploratory stages of a mine these factors must be ascertained before a permanent and economical plant can safely be installed. By neglecting this precaution several notable failures have been made and expensive plants erected only to be sold out later at a loss. In Michigan the copper deposits usually extend to great depths, some of the older mines being a mile deep vertically. Powerful hoisting engines and other machinery in proportion are ultimately necessary for this work. The permanent shaft can be sunk in the footwall so as to enable the removal of the maximum of copper-rock without endangering the shaft. The percentage of copper-rock that can be safely and cheaply mined often has an important bearing on the method of mining that is to be adopted. The shafts where possible follow the dip of the lode, thus avoiding the unnecessary mining of barren ground to reach the lode from the shaft, as would be the case if the latter were vertical. Shafts are now placed a thousand feet or more apart. The drifts from the shafts are driven along the lode from 85 to 150 feet apart, measured on the dip of the lode. From these shafts as starting points all of the lode matter possible is broken down from above by "stoping," as far as the next higher level, by various methods; sorted where possible, and the barren portions left in the mine or returned to it from the surface, as "filling" to support the hanging wall. The amount thus discarded will vary according to the nature of the deposit, up to 40 per cent of the total rock mined. In some cases the copper is so evenly disseminated through the rock that sorting is impracticable and all of the rock goes to the mill. The copper rock from the stopes is trammed by hand, or where the shafts are far enough apart, by mechanical power, to the nearest shaft, hoisted in the cars in a cage, or in skips of a capacity of two to eight tons, dumped on the surface in the upper part of the rock-house and here sometimes sorted again, or all of it delivered to breakers, by which it is crushed to small sizes; it is then transported to the stamp mill. The larger masses of copper mixed with rock are placed under a heavy hammer by which the rock is beaten off; the masses are then sent directly to the smelter. After going through the breakers the fine rock falls into large bins and is drawn off into railroad cars for transportation. To save expense as many operations as possible are performed by gravity. A constant effort also is made to introduce labor saving mechanical devices both underground and on the surface.

Stamping.— The crushed copper-rock from the mine in centre-dump railroad cars is taken to the stamp mill, which sooner or later forms part of the equipment of every permanent mining company. Nature seldom furnishes a place that combines all the essentials of a good stamp mill site. The principal of these are an abundant water supply, dumping-room for the waste products, sufficient elevation for handling the material by gravity through the different stages of the stamping process, accessibility by railroad, and storage room for fuel. The absence of any one of these essentials adds materially to the cost of construction or to that of subsequent operation. Where possible, the side of a hill is selected near a body of water. A stream that will supply three and a half million gallons a day throughout the year is large enough for a one-head mill with a capacity to stamp from 500 to 700 tons of melaphyre or 300 tons of conglomerate in 24 hours. If the stream can be dammed at an elevation sufficient to deliver its water by gravity at the mill about 40 feet above the point where the waste launders leave the latter, its water is utilized in that way. A dam built on a stream near the shore of Lake Superior, to serve two mills that have a daily stamping capacity of about 4,000 tons, cost about $250,000. To pump water from Lake Superior for a mill of nearly the same capacity costs between one and one and a half cents per ton of rock stamped, to which must be added interest and maintenance charges on a pumping plant that would cost nearly one hundred thousand dollars. To obtain water from Lake Superior requires a tunnel under the lake or a large pipe leading from the shore to a crib far enough out in the lake to avoid being choked by stamp-sand and other obstructions. This distance is usually about 1,000 feet.

Where the stamp mill cannot be built low enough to enable the rock cars to run from grade into the space above the rock bins, the cars must be hauled up, one by one, by special haulage mechanism. Where the mill is built with the main lower floor but slightly elevated above the level of the dumping ground, the stamp sand may eventually have to be carried long distances in launders and sometimes must also be lifted to the necessary height by immense sand wheels. Where mills have been built on the exposed shores of Lake Superior the waste sands are removed from time to time by storms, but if built on bays or sheltered places, the heaping up of the sand is likely to give trouble unless the waste launders from the mill are sufficiently elevated above lake level.

The function of the stamp mill is to crush the rock fine enough to be able to separate it from the copper and to recover a maximum amount of the latter. The copper rock from the mine is dumped from the cars into the storage bin at the back of the mill, which is of sufficient capacity to provide against slight delays incident to transportation. From the bottom of the bin the rock runs over a feed pan into the mortar of the steam stamp, into which also a stream of water is constantly flowing. Here the rock is crushed to a size small enough to be splashed by the downward action of the stamp-shoe through screens around the mortar. The larger lumps of copper are withdrawn from the bottom of the mortar through a tube against the force of a small stream of water which prevents the lighter material from discharging with them. The principle of this so-called hydraulic discharge is utilized in some form at several stages of the stamp mill process. The particles of rock and copper that pass through the screen around the mortar then go through a cylindrical revolving screen or "trommel," the oversize from which under a

practice that is now going out of use, is carried back to the stamp, or under better practice, passes directly to a set of rolls that crushes it to a smaller size, thus liberating the included copper and increasing by so much the capacity of the stamp. The entire product from the screens and from the rolls then passes through launders to the classifiers and from these the coarser part of it goes to the jigs. In some cases there is placed under the launders near the stamp-head a box into which by applying the principle of hydraulic discharge, the larger particles of copper fall, the smaller particles of copper and nearly all of the rock passing on to the classifiers. A classifier is a part of the launder system, or a long box through which flows the stream of water from the heads, mixed with finely crushed rock and copper particles; in the bottom of the classifier at stated intervals are openings through which particles of copper and rock drop against a head of water at each opening that can be so regulated as to permit particles of different weight to fall out at the different openings, the heaviest through the first opening, the lightest through the last. On the jigs successively smaller particles of copper are caught on screens of from ten to sixteen mesh, through which gradually sift the very fine copper particles; above the copper caught on the screens accumulate particles of rock with included copper called "middlings." The larger particles of waste rock are carried off gradually at the surface by the jigging motion and by the flow of the water, to the waste launder. The middlings are taken off automatically through an air discharge in front of the jigs and are ground in a Chilian mill, whence they pass to the slime tanks. The fine material passing through the jig sieves goes directly to concentrating tables. The finest particles of rock and of copper that flow through the classifiers from the heads go from these to the settling tanks, where the fine particles of copper with a certain amount of rock material settle gradually to the bottom, and the overflow from the top of the tanks goes to the waste launders. The settlings are then treated on tables provided with elevated strips or "riffles" and by a quick repeated jerky motion in the direction of their length the heavier particles of the pulp, namely, the copper, are gradually separated from the rock matter and collected at the end of the table in tanks or barrels. Middlings or material containing a good deal of rock and some copper from along the irregular line of demarcation between copper and rock are collected and re-treated in the same way.

Smelting.—The product of the mine that goes directly to the smelter is in the form of masses, often several tons in weight. This "mass" copper with the product of the stamp mill constitutes what is called "mineral." Large pieces of rock crushed in the breakers at the mine frequently contain small masses which are collected from the rock as the latter goes into the stamp-heads and shipped to the smelter in barrels. This product is called "barrel work." Some pieces of copper as large as one's fist unavoidably get into the stamp-heads and these are taken out through the hydraulic discharges as described above and are shipped as "headings." The finer copper mixed with more or less rock is collected in different grades, the number of these being sometimes as many as six, but in modern practice being reduced to as few as two. The smallest of these grades are called "fines" and "slimes," of which many particles are often minute and light enough to float on a moderate current of water, and hence are difficult to save.

The impurities found with the product of the stamp mill are principally the "vein" rock, from which, owing to the intimate mixture of the copper and rock, the separation of the former has been incomplete, and incidental impurities, such as iron, sulphur, arsenic, with traces of nickel and of some of the rarer elements. The function of the smelter is to remove the impurities and to leave the copper in a condition best fitted for the different uses to which it is to be put. These are principally: (1) for electrical purposes, as wire, where great conductivity is required; (2) for rolling into plates, where great tensile strength may be desired; and (3) for mixing with other metals to form alloys. The forms in which it leaves the smelter are indicative of these uses. They are respectively bars, cakes and ingots. When it is known that .07 of 1 per cent of arsenic in copper will reduce the conductivity of the latter to 75, and that arsenic is almost always present in copper ores, and to some extent also in native copper, the necessity of careful refining will be realized. Copper derived from copper ores generally contains enough impurities to render it unfit for electrical purposes unless it is refined electrolitically. For this purpose it is cast into plates called anodes. In the Lake Superior region the copper derived from the higher or younger formations of the copper-bearing series has generally been found to be pure enough on leaving the smelter to be used for wire (99.9 per cent fine and upwards), but the copper from the lower or older beds usually carries enough arsenic to render such a use impossible without further refinement. This copper, on the other hand, with the proper percentage of arsenic, is tougher and more desirable for some uses than the purer grade.

The mineral is treated first in a melting or reverberatory furnace, the flame passing from the fire-box over the copper under a low arched roof with a stream of air brought in from below. This is an oxidizing process and the slag that separates from the copper and is drawn off from the surface of the latter contains from 8 to 14 per cent of the metal, largely in the form of oxides, mixed with a large amount of the impurities. After the removal of the slag, charcoal is thrown on top of the melted copper and the liquid mass of the latter is agitated by the insertion of green poles of hardwood ("poling"), the ignition of which and of the charcoal produces the carbon that takes up the oxygen in the copper, thus changing the action of the furnace from an oxidizing to a reducing process. This is often preceded by blowing a charge of air through the molten copper. By dipping small buttons of the metal in a trial ladle from time to time, if the copper sets with a level surface the process of "poling" is complete. If the reduction is overdone, the charge must be reoxidized and again reduced. Thereupon the copper is ladled or run out into moulds. The tendency of modern practice has been to

increase the size of the melting furnace contingent upon the ability to keep the heat throughout of an even temperature. Some modern furnaces can take a charge of 100 tons at a heat. It has also been found advantageous instead of doing the refining in these large melting furnaces to run the copper from them into special refining furnaces. The fuel used in the melting furnace is soft coal.

The slag derived from the reverberatory furnace is broken up and eventually taken to a blast furnace, otherwise called a cupola, where the action is reducing, and here the slag is remelted. This process is substantially the same as the process in the reverberatory furnace except that the copper being mixed with a large amount of slag, other substances such as limestone, iron or silica are added to form a proper mixture for fusing and for the proper separation of the copper. The relative amounts of the several materials are ascertained in advance by analysis. All of the ingredients are mixed with anthracite coal, with or without coke, and to stimulate ignition a cold blast of air under compression is driven upwards through the mass. The copper falls out and is drawn off at the bottom of the furnace, containing even then a larger amount of impurities than the product of the first process; this copper should be refined separately. In practice the slag-copper is poured into ingots or ingot-bars, but never into wire bars. It is sometimes specially branded.

The slag that is finally rejected contains about .7 of 1 per cent of copper and is usually discharged into a stream of water which granulates it and carries it away in launders.

The Lake Superior copper mines will produce in 1904 upwards of 200,000,000 pounds of refined copper, or about one fifth of the world's production.

LUCIUS L. HUBBARD,
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Copper and Brass Industry. The Naugatuck River has its sources in the hills of northwestern Connecticut, and flows southward for about 40 miles to its junction with the Housatonic River at Derby, taking its course through a narrow, winding valley, between steep, well-wooded hills, that rise directly from the river-bank to a considerable height. From Torrington, at the head of the valley, to Derby, there is a fall of about 600 feet. Four times, within six miles from its mouth, the water is diverted from its channel by dams, and held in large reservoirs to furnish water-power. Farther up the valley, wherever it broadens to give room for a village or a city, there are water privileges, and the power is utilized for manufacturing purposes.

In this narrow valley, which contains a population of more than 100,000, evidence of thrift and prosperity is everywhere seen in the neat, comfortable homes of the workingmen, and the fine houses of their employers. This is the seat of the brass-rolling industry of America. Nine great corporations are here directly engaged in this business, producing about three fourths of the total quantity of rolled brass manufactured in the United States, giving direct employment to 9,000 persons, and indirectly to many thousands more. Over 175,000,000 pounds of copper, or about one half the total quantity of this metal consumed in the mills of the United States, are conveyed annually to the Naugatuck Valley for use in these manufacturing establishments.

The valley of the Housatonic River, running parallel with the Naugatuck through Connecticut, furnishes better water privileges, and broader plains for laying out towns and cities; but in the Naugatuck Valley were found the men of foresight, energy, and activity who could originate great enterprises and carry them to completion. They began the brass-rolling industry 70 years ago. Its development and progress with the growth of the country are due to the energy and ability of those who have conducted the business and furnished the necessary capital for its enlargement. The causes that have led to the concentration of this industry in the Naugatuck Valley are more complex. The cheap power afforded by the water privileges in the valley undoubtedly led to the establishment there of the first rolling-mills, which, as they increased in size and capacity, finally outgrew the water-power, and are at the present day operated by steam, or by steam and water-power together.

The mills originally established in the valley have enlarged and extended from time to time to keep pace with the growing demand for brass. According to the general law governing the concentration of kindred industries and trades in particular localities, new mills were started there, even after the water-power had ceased to be a determining factor in the problem of location. Other advantages, such as the cheapness and accessibility of wood of the variety best suited for annealing purposes, were among the causes that held the trade in the valley. Then, too, there arose a race of workmen skilled from generation to generation in the mixing, rolling, and manipulation of brass; and as time went on and competition increased, the production of rolled metal becoming less profitable, many of the rolling-mills began remanufacturing their own metal. Other corporations were formed, some being direct offshoots from the brass mills, until the location became what it is to-day; a great centre for the reworking and consumption of metal. There are many reasons why it is desirable that a brass-mill should not be too far from the place where its product is chiefly consumed, and thus it happens that, while a few brass manufactories are operated in other parts of the country, the Naugatuck Valley still is and probably will remain the seat of the brass-rolling industry in America. Other enterprises, such as the rolling of iron and steel, thrive best where their raw material, their fuel and labor, are cheapest and most accessible, transportation, labor, and fuel being great factors in the cost of the product; but the brass manufacturer, working a high-priced raw material, and bringing his finished product to the point of nicety in gauge and quality, finds the cost of labor, fuel, and transportation factors of far less importance relatively, and he is governed largely by other considerations in his choice of locality. Therefore, while the shifting centres of the manufacture of iron and steel are marked throughout the country by abandoned furnaces, the seat of the brass-rolling industry remains to-day where it was established 70 years ago, it being a note-

worthy fact that nearly all of the brass mills outside of the State of Connecticut were constructed and are operated by Connecticut men.

Israel Coe, a farmer of Connecticut, John Hungerford, of Connecticut, and Anson G. Phelps a capitalist of New York, and founder of the house of Phelps, Dodge & Company, were pioneers in brass manufacturing in this country, and in 1834 they built a brass mill at Wolcottville, now Torrington, Conn. Previous to 1830, brass was imported, or manufactured here in a very primitive way. As early as 1811 James G. Moffett of New York, rolled brass in small quantities, using for power a sweep actuated by oxen. In 1802 the manufacture of gilt buttons was begun in Connecticut by Abel Porter & Company. At that time these buttons were articles of fashionable use. To obtain brass for this purpose the mixture was cast in ingots at Waterbury, and taken to Bradleyville, near Litchfield, Conn., where there was an iron mill driven by water-power; here it was broken down and rolled into strips, and returned in a rough state to the button factory in Waterbury, where it was rolled thinner by being passed between two rolls two inches in diameter, driven by horse-power. The copper for brass-making was obtained from old boilers which had been used in distilleries and in sugar-making. This copper was cast into ingots and mixed with spelter, which was obtained from abroad. In 1808 Abel Porter & Company purchased the water-power now owned by the Scovill Manufacturing Company at Waterbury, and soon afterward put in rolls suitable for breaking down and finishing brass. For a period of about 20 years they rolled brass, but it does not appear that their production was any more than enough to supply their own requirements. In 1830 the firm of Holmes, Hotchkiss, Brown & Elton established a mill and engaged in the manufacture of sheet brass at Waterbury. This was substantially the beginning of the sheet-brass business in America, although the metal, in small quantities, may have been occasionally supplied to consumers before that time by the firm of J. M. L. & W. H. Scovill, and by Benedict & Coe, of Waterbury.

There was at that time also a demand for brass kettles, which were manufactured in England by a process known as the "battery" process: that is, they were hammered into shape from metal blanks. The establishment of the mill at Torrington, at the head of the Naugatuck Valley, in 1834, was for the purpose of rolling brass for use in manufacturing these kettles, and to supply the growing demand of the button factories. A small rolling-mill was built, with machinery imported from England, and Israel Holmes of Waterbury, was engaged as manager of the mill. There was great difficulty in securing workmen competent to carry on the business. Mr. Holmes was sent to England, and succeeded in procuring a few experienced men. He afterward made another trip abroad for the same purpose, but the English manufacturers, fearful of losing their American trade, endeavored to prevent him from hiring their men, and it was with great difficulty and some danger to himself that he succeeded in embarking a colony of workmen and their families, about 30 persons in all. These were landed at Philadelphia, taken in a schooner from there to Hartford, Conn., from which place they proceeded on foot through the woods, a distance of 25 miles, to Torrington.

From this small beginning, and with no end of difficulty and discouragement, the enterprise continued to grow. Local competition arose, and in 1840 Edwin Hodges of West Torrington, started a mill for the purpose of making brass kettles, and also for drawing brass wire. This seems to have been the first brass wire-drawing establishment in this country. It was located in Cotton Hollow, in the town of Torrington. The enterprise was unsuccessful, and the mill was soon closed, with the loss of all the capital invested. In 1841 the original enterprise at Torrington was made into a stock company, with a capital of $50,000. It was named The Wolcottville Brass Company, and the incorporators were John Hungerford, Anson G. Phelps, and Israel Coe. The records of this company for the first few years of its existence contain some interesting details. The copper used was imported from Chile, or was obtained in the form of old copper, which was collected from different places throughout the country. The price of copper was then 18¾ cents per pound. Spelter, which was imported, cost 8¾ cents per pound. The fuel used was mainly wood, but some Lehigh coal was procured, which cost, at Hartford, $8.43 per ton, to which was to be added the cost of transportation by teams from Hartford to Wolcottville. Fire-brick for the furnaces cost $60 per 1,000. The manufactured product, in the form of rolled and sheet brass, was valued at 26 to 30 cents per pound. It was taken by teams either to Waterbury, or 25 miles across a hilly country to Hartford, and from there shipped on sloops to New York. Upon the site of the works occupied by the Wolcottville Brass Company are to-day the great factories of the Coe Brass Manufacturing Company. The name of Anson G. Phelps is perpetuated by the city of Ansonia, the Ansonia Brass and Copper Company, and the Ansonia Clock Company, as well as by the firm of Phelps, Dodge & Company, which he founded; and the name of Israel Holmes appears in the title of the corporation of Holmes, Booth & Haydens, of Waterbury.

The decade from 1840 to 1850 saw the birth of many of the prominent brass manufacturing corporations of the present day. In 1843 a joint stock company at Waterbury was organized under the title of the Benedict & Burnham Manufacturing Company, with a paid-up capital of $100,000. Aaron Benedict was president and treasurer, and John S. Mitchell secretary. Mr. Aaron Benedict continued at the head of the company until his death in 1873. This company now operates extensive works, and gives employment to 967 persons, manufacturing brass, German silver, etc., and remanufacturing metal.

The Waterbury Brass Company began business in 1845 with a capital of $40,000. Among the incorporators were John P. Elton, Lyman W. Coe, Israel Holmes, and Hobart V. Welton. They now give employment to 525 persons, and manufacture brass, brass wire, etc., and also remanufacture.

In 1849 the Naugatuck R.R. was completed, and the product of the valley mills was thereafter shipped by rail to tidewater at Bridgeport.

In 1848 Thomas Wallace and his sons, John, William, and Thomas, began the business of

wire drawing at Birmingham, Conn. Their cash capital was $500. Their knowledge of their trade enabled them to increase their business, and in a few years they built a factory at Ansonia, which has been greatly enlarged, and is now owned and operated by the Coe Brass Manufacturing Company.

The Scovill Manufacturing Company of Waterbury succeeded the firm of J. M. L. & W. H. Scovill, and was incorporated in 1850 with a capital of $200,000, which has since been increased. They now manufacture brass, German silver, etc., employing 2,500 persons, and are extensive remanufacturers of metal.

The Coe Brass Manufacturing Company of Torrington, Conn., was founded by Lyman W. Coe in 1863, and succeeded the Wolcottville Brass Company. Lyman W. Coe, the son of Israel Coe, was the president of the corporation, which began business with a capital of $100,000. Their capital has been increased from time to time, and they now employ 1,650 persons, manufacturing brass, German silver, tubes, wire, etc., with extensive works at Torrington and Ansonia.

In 1844 Anson G. Phelps purchased extensive lands in the vicinity of what is now the city of Ansonia, which was founded by him, and named in his honor. He constructed a dam across the Naugatuck River, a canal, large reservoirs for water-power, and built a mill for rolling copper. The firm of Phelps, Dodge & Company had for some years prior to 1844 operated a copper rolling-mill at Birmingham, Conn. The water privilege at Ansonia is now owned and operated by the Ansonia Land and Water-Power Company, and is the source of water-power for the city of Ansonia. Mr. Phelps brought from the Wolcottville works J. H. Bartholomew and George P. Cowles, who managed the business at Ansonia under the name of the Ansonia Brass and Battery Company, the term "battery" being indicative of the process by which brass kettles were hammered from metal blanks. This method of making kettles was in use until 1851, when it gave place to a patented process for spinning kettles from circular blanks of metal. The business of the Ansonia Brass and Battery Company was conducted by the firm of Phelps, Dodge & Company of New York. A brass-mill was built, and later a wire-mill. The company afterward engaged in the manufacture of clocks. In 1869 this manufacturing enterprise was incorporated under the name of The Ansonia Brass and Copper Company. In 1877 the manufacture and sale of clocks had increased to such an extent that it was decided to form a new joint-stock corporation under the name of The Ansonia Clock Company, which began business on 1 Jan. 1878. The location of this part of the company's business was transferred to Brooklyn, N. Y., where large factories were erected and are now in operation, employing 1,687 persons and producing a daily average of 6,500 clocks and watches, which are marketed in every part of the world.

The Ansonia Brass & Copper Company operates four factories at Ansonia, where they give employment to 1,500 persons, in the manufacture of sheet brass, sheet copper, wire, tubing, etc.

The American Brass Company, incorporated under a special charter from the State of Connecticut, with a capital at present of $10,000,000, — which may, under their charter, be increased to $20,000,000,— began business in January 1900, and now owns the entire capital stock of the following corporations: The Coe Brass Manufacturing Company, The Ansonia Brass & Copper Company, The Benedict & Burnham Manufacturing Company, The Waterbury Brass Company, The Holmes, Booth & Haydens Company, The Chicago Brass Company.

Taking into account the capital employed, and the magnitude of its operations in brass and copper, this company is the most important brass manufacturing enterprise in the world. The constituent companies are operated independently, and increased profit is sought by harmonious and economical management, rather than by any increase in the prices of the manufactured product. The combined companies give employment to 7,000 persons.

During many years brass manufacturing was conducted on what would now be regarded as a very small scale, and, although the methods pursued at the present day are substantially the same as at the beginning, great progress has been made in cheapening these methods, and improving the quality of the articles manufactured. It is stated that in the early forties it was customary for the manufacturers at Waterbury annually to appoint a committee to make the long journey to Baltimore for the purpose of purchasing copper for the season's supply. At that time the purchase of 500,000 pounds of copper was sufficient for a year's supply for these manufacturers. At present that quantity would not supply the demand of the Naugatuck Valley for one day.

Copper and spelter being the metals from which brass is made, a brief account of the sources of supply from which these materials are obtained will throw some light upon the development of the business of brass and copper rolling. The first copper mine worked in the United States was the Simsbury mine at Granby, in Connecticut. The record of this mine extends back to the year 1705. It was worked until 1770, but was not profitable, and only a small quantity of ore was taken out. During the War of the Revolution it was used as a prison, and to-day it is an object of interest on that account. About the year 1719, the Schuyler mine, near Belleville, N. J., was opened aand became one of a number of small mines which were worked in that section of the country for a series of years following. The Gap mine, in Lancaster, Pa., was started in 1732. The production of copper from all these openings, however, was of very little commercial importance, and until the Lake Superior region became a source of supply, the consumers of copper in the United States had to procure their raw material in Chile. It was brought to this country in the form of pigs, and refined near Boston, at Baltimore, and at other points along the coast. In 1844 the Cliff mine, near Eagle River, Lake Superior, was opened, and in 1845 regular records of production were begun. The great development of the copper-mining industry at Lake Superior soon placed the United States in the front ranks of the copper-producing countries of the world, and the product of these mines, being of a quality much finer than the copper produced abroad, naturally took the place of the foreign product for home consumption. Copper production in the United States from 1845 to 1880 kept pace with home consumption, a comparatively

small quantity being exported up to the last-named period, so that the record of the copper produced in the United States between the periods named will indicate the progress made in manufactures of brass and copper. Beginning in 1845 with a product of 100 tons (which was much less than the quantity required for home consumption), the record for periods of 10 years is as follows: 1850, 650 tons; 1860, 7,200 tons; 1870, 12,000 tons; 1880, 27,000 tons.

Comparatively little fine copper was imported to the United States after 1800. In 1879 the Lake Superior region furnished about 83 per cent of the total quantity of copper produced here, but after 1880 the opening of the copper-mining regions of Arizona and Montana increased the output largely beyond the quantity required for domestic use. A heavy exportation at once followed, and this country became one of the world's great sources of supply. The quantity of copper produced in the United States in 1903 is as follows:

1903	Tons (2,240 pounds)
United States production	300,000
Importations	69,539
Exported from the United States	142,139
Estimated consumption in the United States	219,000

It is impossible to ascertain the stock of copper now held in the United States, but it is known that there is a constant stock equivalent to two months' production, either in process of treatment or in transit to market, without considering the stock carried in reserve.

A fair estimate of the average price of copper in the United States from 1845 to 1859 is 20 cents per pound. From 1859 to 1876 the yearly average price of copper varied from 20¼ cents to 32 cents per pound, with the exception that in the years 1864 and 1865 the price was advanced, so that in 1864 the average price of Lake Superior copper was 46¼ cents per pound, and in 1865 36¼ cents. After 1876 there was a gradual decline in the yearly average price, which was 18⅝ cents in 1877, and 11¼ cents in 1887. In 1894 the price touched 9 cents per pound, which is the lowest point recorded.

In 1899 the increased demand for copper in the United States and abroad was the cause of a rapid advance in the price of the metal, which sold as high as 18 cents per pound. The enormous exports (150,000 tons in the year 1900) and the steady increase in the demand for home consumption, kept the price between 16 and 17 cents until December 1901.

In the fall of 1901 it became known that a considerable stock of unsold copper had accumulated in the hands of one of the largest of the producing mining companies. Meanwhile, owing to decreased consumption abroad, the exports of copper had fallen off at the rate of about 65,000 tons per annum (the total quantity exported in 1901 being about 95,366 tons). Toward the end of the year there was a sharp decline in the London market, followed by a series of reductions in the price of copper in New York, which, emanating from one source, brought the price, within a period of 30 days, from 16¾ cents down to 11 cents per pound. The first effect of this action was to check consumption, but when it was known that copper could be bought for forward delivery at 11 cents per pound, the demand for manufactured copper increased to such an extent that large buying of the raw material followed, and the price of copper quickly advanced to 12½ cents. The average price of lake copper during 1902 was 11⅞ cents, and in 1903 about 13½. The average price obtained by the Lake Superior mines for copper during 30 years previous to 1903 was about 12¼ cents.

Since we became great exporters of copper, the price of this metal in the United States has been nearly at a parity with the price in Europe. With increased production the cost of mining has been greatly reduced, while improvements in metallurgy and methods of electrolytic extraction, have brought into the market great quantities of copper suitable for the finest work from sources which formerly furnished only coarse and ordinary grades of material. In former years the tariff upon copper affected the price of the raw material in this country, often enabling the mining companies to obtain from the consumer at home a higher rate than that which ruled abroad. The price of copper in this country was sometimes sustained by arrangement between the mining companies, who would market the copper here at a fixed price, and ship their surplus product abroad at a considerably lower rate. The American brass manufacturer was, therefore, usually confined to a home market for his product, and the statement that, in certain cases, he succeeded in taking large foreign contracts for brass, with the disadvantage of having to pay a higher price than his competitor abroad, not only for his raw material but for his labor and supplies, is the best possible tribute to the excellent quality of his work. Ingot copper was admitted to this country, duty free, until the Act of 30 July 1846, when a duty of five per cent was imposed. The Act of 3 March 1857 restored copper to the free list. Subsequently duties were imposed upon copper: in 1861 of two cents per pound, and after that of from two and a half to five cents per pound. The McKinley Bill made the duty one and a quarter cents per pound, and at present ingot copper is on the free list.

The first refined spelter produced in this country was made in the year 1856, at Bethlehem, Pa., from ores mined there, and it was sent to the government arsenal at Washington. Up to 1865 or 1866, the spelter used by brass manufacturers was imported from Germany and Belgium. In 1867 the Missouri Zinc Company, at Carondelet, Mo., began to make spelter from Wisconsin ores. The first year they made about 1,800 tons; the next year about 2,500 tons. This was used in the United States. In 1869 the first zinc ores were discovered in southwestern Missouri, and since then the development of the zinc industry has been constantly increasing. The output of the year 1903 was 157,900 short tons of metallic zinc or spelter. American brass manufacturers have used domestic spelter almost exclusively for the past 25 years, the quality of the American product being superior to that of the foreign article. One of the finest grades of spelter is produced in New Jersey, and is sold at a high price, but the greater part of the spelter produced at present in this country comes from southwestern Missouri and Kansas. At no time within the past 25 years has spelter been admitted to the

United States free of duty. The duty under the McKinley Bill was one and a half cents per pound. Under the present tariff the duty is one cent per pound.

On 13 Jan. 1801, Paul Revere, of Revolutionary fame, wrote to a friend in London, requesting him to go down to Maidenhead, where rolling machinery was manufactured, and ascertain the price of a pair of rolls 9 inches in diameter and 20 inches long, for making sheet copper. Col. Revere was a silversmith, and had previously corresponded with Benjamin Stoddard, secretary of the navy, upon the subject of copper rolling. It is not known whether or not these rolls were procured at that time, but in January 1801, Col. Revere purchased an old powder-mill at Canton, Mass., where he began the production of sheet copper. The business has been carried on continuously since that time, and is now incorporated under the name of the Revere Copper Company. Among the names of those originally connected with this enterprise are Joseph A. Revere, James Davis, John Revere, and S. T. Snow. This company was finally consolidated with the Taunton-New Bedford Copper Company.

In 1812 the Soho Copper Company was established in Belleville, N. J., where there is a good water-power, and water transportation by canal and by the Passaic River. The originator of this enterprise was Harmon Hendricks, the son of Uriah Hendricks, who was an importer of copper and metals. Some of the buildings were of brick, roofed with tiles imported from Europe. The rolling-mill was of wood, and contained one pair of breaking-down rolls, one pair of sheet rolls, and one pair of bolt rolls, all of which were imported from England. The plant and machinery cost $50,000, and were intended for the purpose of furnishing the United States government with heavy copper sheets for boilers, and bolts for ship-building, during the War of 1812. This business has descended from father to son in a direct line, until it is now in the hands of the fourth and fifth generations, and is known as the "Belleville Copper Rolling Mills," operated by Hendricks Brothers, and employing 100 men. In the year 1815 ingot copper sold for 18½ cents per pound, and the price of copper sheets was 39 cents per pound.

The Gunpowder Copper Works were built in 1817 on the Gunpowder River, 10 miles from Baltimore, by Levi Hollingsworth. Water-power was used in manufacturing. In 1866 the rolling-mill was transferred to Canton. It is now operated by the Baltimore Copper Smelting & Rolling Company, who are engaged in smelting, and in the manufacture of blue vitriol and sulphuric acid.

The manufacture of yellow metal for sheathing vessels was the subject of a patent by H. F. Muntz, of Birmingham, England, about the year 1840. This mixture, which contains a large percentage of spelter and can be rolled while hot, being cheaper than copper, naturally came largely into use for ship-sheathing. It was first made in this country by the Revere Copper Company, within a year or two after its production in England. Later, it was made by the Taunton Copper Manufacturing Company, the New Bedford Copper Company, and the Bridgewater Iron Company. The decline of American ship-building, and legislation permitting American vessels engaged in foreign trade to use the foreign metal without payment of duty, have greatly decreased the demand for yellow metal in the United States.

The causes that have tended to localize the manufacture of sheet brass do not affect the rolling of copper. The makers of sheet copper do not remanufacture their product. So that, while out of a total of 16 brass-mills 12 are located in Connecticut, the copper-mills are distributed throughout the country; in Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Michigan, and Illinois.

The manufacture of seamless tubes of brass and copper is an important part of the brass business. These tubes are made in the Naugatuck Valley by the Coe Brass Manufacturing Company, the Benedict & Burnham Manufacturing Company, the Holmes, Booth & Haydens Company, and also by the American Seamless Tube Company of Boston, and by other manufacturers. Early in 1848, Joseph Cotton, Joseph H. Cotton, William E. Coffin, Holmes Hinckley, and Daniel F. Child, all of Boston, despatched to England an engineer, Joseph Fox, to learn how to make seamless brass tubes, paying a large sum to Messrs. Green and Alston, the English patentees, for the instruction of Mr. Fox, and the right to make tubes by their process in the United States. Previous to that time all copper and brass tubes for use in locomotive and marine boilers and for the hundreds of other uses to which tubes were put, were brazed; that is, made of strips of metal put in a rounded form, and their edges brazed together. In 1850 the gentlemen before named organized a corporation called the American Tube Works, of Boston, and began the manufacture of seamless drawn brass tubes. Such tubes have taken the place of the brazed tubes in all cases where steam or other high pressures are involved.

There are no public records showing the present condition of the brass and copper industry in America. Figures can only be obtained by personal application to the manufacturers. The following details, showing the state of the business at present and covering the year ending 1 July 1901, are taken from information furnished by 20 of the largest corporations, and include the entire business of the country in rolled brass, copper, tube, and wire. In a few instances, where information was refused, an estimate of the business has been made, but this does not exceed 13 per cent of the total.

The nominal capital invested is $17,000,000, but the amount of the actual investment is about $29,000,000.

The number of persons employed is 15,558.

The annual consumption of copper is 300,000,000 pounds.

The annual consumption of spelter is 43,500,000 pounds.

The value of the annual product is $73,700,000, of which the metal is valued at $67,250,000, and the remanufactured products at $6,450,000. This includes only remanufacturing by brass rolling mills.

Brass founders or manufacturers of articles of cast brass are not included in the foregoing figures. That is a separate branch of business, and it is carried on by a great number of foundries in the United States, consuming a large quantity of ingot copper and of old metal. Many manufacturing concerns, also, have their own

foundries, where metal is cast, to be used in their various departments.

Any one of the principal establishments in Connecticut will serve as a type of the modern brass and copper rolling-mill. The buildings are usually of brick, roofed with iron, and contained in an inclosure of from 12 to 20 acres. They are generally one story high, and are light and well ventilated. The machinery is of modern construction and the best that can be made. The motive power is steam. In the remanufacturing departments automatic machinery takes the place of hand labor. In the rolling-mill, metal of the finest finish is produced, and brought to a degree of accuracy in gauge which is not usually found in other countries. Eyelet metal, for example, is required to be rolled to a width of six inches, and not to vary more than one two thousandths of an inch in gauge; that is, it must not vary in thickness more than one fifth of the breadth of a human hair. It is well understood by those who are familiar with the methods employed abroad, that nearly all the improved processes of brass rolling have originated in this country; that we have taken the lead in this branch of business from the beginning, and that our products at present, in point of accuracy of gauge and fineness of quality and finish, are far in advance of similar articles produced in other countries. This has been brought about indirectly by the fine quality of our copper and spelter, which has enabled our manufacturers to produce brass of a kind readily adapted to mechanical manipulation, while Yankee ingenuity has taught our mechanics to invent machinery for metal rolling and metal working, which in its turn has created a demand for metal of the utmost nicety in gauge; so that a very large proportion of the brass produced in this country to-day is gauged by the micrometer, which registers fractions of the thousandth part of an inch.

Many of these brass manufacturing corporations have a nominal capital, which represents only a small part of the real sum invested. They have from year to year enlarged their plants, using their surplus earnings, and increasing their outlay without increasing their capital, so that often the real investment is many times the amount of the capital stock. Brass rolling is now carried on upon a narrow margin of profit, so that what would appear to be a fair dividend upon the nominal capital is a small return for the actual investment. As a natural result in some cases new plants, erected with modern machinery, have had to close their doors, being unable to compete with those already established. Laborers employed in brass-works are well paid, and, as a rule, are thrifty, often owning their houses. Difficulty with workmen is of very rare occurrence, and no serious labor troubles are recorded in the history of the business.

ALFRED A. COWLES,
President The Ansonia Brass and Copper Co.

Copper in the Arts, is in demand with an ever increasing expansion. This is apparent from a consideration of its use in telegraphs, telephones, lighting, and railway work. First of all, in telegraphy, copper circuits are more and more in vogue, displacing the iron of earlier periods, and while telegraphy has almost reached its limit of growth, there is a steady demand for copper in operating existing works. In telephony, on the other hand, the employment of copper is increasing by leaps and bounds. New York alone is likely to spend some $25,000,000 on its telephony in the next five or six years, and it is needless to say that much of that money will represent copper cables in subways, wiring of big switchboards, circuits in office buildings, hotels, etc., even the little windings on the instruments making a very considerable total weight in the aggregate.

In electric lighting, copper is being employed more and more every day, and each lamp or motor that goes in demands for its construction many pounds of copper, from the big generator in the dynamo room, up to the key, or switch, that turns on the light, or sets the motor whirling. Here again the increase of pressure for transmission has simply enabled larger areas to be served, and has thus stimulated the use of electricity by the public, and aided the introduction of a variety of apparatus not before in contemplation. The wider availability of current and its lowering price everywhere have given a genuine boom to the use of electric motors, and in this field the circuits are necessarily heavy. In 1900 not five per cent of the power in American factories was electrical, so that the opportunity here can be readily imagined. The producers of motors find their output doubling year after year, while the motors themselves increase in size and of course consume a good deal of copper in their construction, as do the generators which furnish the current alike for light and power.

Electric railway work is obviously a department that consumes copper in enormous quantities. Until recent years the art has dealt chiefly with street railways, and it is imperative that in large centres of population the pressure of the current should be kept down, even when the conductors are put out of the way in a slotted conduit, as in New York. Any one who notices the bulk of the feeder cables, when they are carried overhead on poles, will not need to be told that there is a vast quantity of copper in them. Within the last five years the trolleys have been pushing across the rural districts, and many of them are 50 or 60 miles long, with current delivered at high pressure to sub-stations in order to keep down the amount of copper in the feeding system, but in the aggregate the use of copper here again is enormous. The motors also for this interurban work are bigger, and often there are four of them to a car, instead of two, as in the cities. Every electric car moreover now is wired with copper circuits for electric lighting, and frequently also for electric heating.

In the electric railway field the next step is to the operation of large systems hitherto handled with steam. Here we get into the realm of large units, big weights, long distances, and no matter how high the potential may be at which current is delivered at certain points along the line, vast masses of copper become necessary and cannot be dispensed with. The elevated roads in Chicago, New York, Brooklyn, and Boston are but a beginning in this direction, based upon the use of a third rail to give current to the cars. But while the employment of the rail releases a good deal of copper from the service, the current still has to be fed into the system, and very heavy cables of copper are required to do that. For such work as the

New York Central and the Pennsylvania R.R.'s now are laying out for their metropolitan terminals millions of pounds of copper will have to be laid down. But the innovation will not stop at terminals either here or in Europe.

Copper, Commercial and Industrial Uses of. The chief use of pure copper to-day is for electric work. It is used in the construction of dynamos and motors; great quantities are rolled into wire for many purposes, including submarine cables, long-distance telephone lines, and transmission lines for light and power service.

In this country copper is usually classified in three grades, lake, electrolytic, and casting copper, and is sold in the form of ingots, anodes, and wire bars. Lake copper, particularly that from certain mines in the Lake Superior region, is very pure and tough, and for many years sold at a premium over other grades. It is particularly adapted to the making of copper wire. Electrolytic copper, that is, copper electrolytically worked, now sold just as pure as lake, is used for making wire, and since the quantity of electrolytic sold is much greater than the amount of lake, electrolytic is now the standard used in market quotations. Casting copper usually contains impurities that impair its toughness and electric conductivity, these impurities being arsenic, antimony, and iron. Even a very small percentage of arsenic spoils copper for wire-making. But the impurities named are not usually present in sufficient quantity to impair the value of the copper in making alloys. Casting copper is usually sold in ingots; lake and electrolytic in ingots, wire bars, and anodes. Copper anodes are heavy sheets of the metal, used in copper-plating by electrolysis, particularly in the making of stereotypes, electrotypes, and the process cuts used for printing illustrations in newspaper and magazine work. A large amount of copper is used in this way, though the film of copper on the face of an electrotype is very thin.

Uses of Alloys.— Numerous and important as are the uses of copper, of perhaps even more importance are the uses of its alloys, including gold and silver alloys, various brasses and bronzes, German silver, etc. Copper is added to gold and silver, soft metals, to increase the hardness and resistance to wear. Thus the gold used in jewelry contains from 750 to 920 parts gold with 250 to 80 parts copper. United States gold coin contains 900 parts gold and 100 parts silver, United States silver coin contains 900 parts silver to 100 parts copper. Brass is an alloy of varying composition, but ductile and malleable, that is made into thousands of articles in daily use. Red brass contains 90 parts of copper and 10 parts of zinc; yellow brass contains 60 per cent copper and 30 per cent zinc, but brasses sometimes contain tin, and even lead. Bronze is a more brittle alloy than brass, but becomes ductile after tempering, that is, heating and cooling. The bronze used in making bronze medals usually contains 93.5 to 95 parts copper, 6 to 4 parts of tin, and .5 to 1 part of zinc. Fine statuary bronze contains 9,140 parts copper, 553 of zinc, 170 of tin, and 137 of lead. Gun-metal contains 100 parts copper to 10 parts tin; bell-metal, 78 parts copper to 22 parts tin; speculum metal, 67 parts copper to 33 parts tin. Aluminum bronze, used in ornamental articles, contains 90 to 95 parts of copper and 10 to 5 parts of aluminum. Phosphor-bronze and manganese bronze are alloys of high tensile strength and great resistance to corrosion by acids or alkalies; they are used for making ships' propellers, for pump-valves and pistons, etc. Tobin bronze is used in marine work. An important group of copper alloys, in the manufacture of which a large amount of copper is used, comprises some of the so-called bearing-metals and antifriction metals, used to reduce the friction of moving parts in engines and machinery. These alloys may contain tin, lead, zinc, bismuth, antimony, iron, and phosphorus. "B" alloy, used by the Pennsylvania Railroad, and one of the best bearing-metals known, contains 77 per cent copper, 15 per cent lead, and 8 per cent tin. Of the other alloys mentioned, German silver, used in electrical work and in various semi-ornamental ways, contains 50 parts copper, 25 parts zinc, and 25 parts nickel, or 50 parts copper, 14.8 parts nickel, 3.1 parts tin, and 31.9 parts zinc.

Salts of Copper.— By far the most important salt of copper is cupric sulphate (blue vitriol) $CuSO_4.5H_2O$. The anhydrous salt $CuSO_4$ is white. It is made in a variety of ways; for instance, by boiling copper shavings with concentrated sulphuric acid; but it is now made chiefly at plants for the reduction of copper ores by leaching the roasted ore with sulphuric acid. The uses of cupric sulphate are various. It is used in medicine, in dyeing black on wool and cotton, and as a source of other copper compounds. With a solution of carbonate of lime it forms Bordeaux mixture (a mixture of copper carbonate and sulphate of lime) that is used in great quantities by farmers and growers of orchards and vineyards as a fungicide. An important use of cupric sulphate is as the bath in copper-plating and electrotyping. It is also used in electric batteries.

Copper forms a variety of green or bluish compounds used as pigments. Of these, Scheele's green, cupric arsenite, apple-green in color, is now little used. Brunswick green, a basic copper carbonate, has the same composition as malachite and has been made by simply pulverizing and purifying that ore. Casselman's green, of variable composition, is formed by boiling copper sulphate with an alkaline acetate. Schweinfurt green or emerald green is the most beautiful of the copper greens, but is very poisonous. It is copper aceto-arsenite, $Cu(C_2H_3O_2)_2$, $3Cu(AsO_2)_2$. When this compound is used for coloring wall-paper, the paper if pasted on a damp wall may give off arsenical compounds, probably arseniureted hydrogen AsH_4 that may cause serious illness to the inmates of the room. Paris green, a copper compound used in great quantities by farmers as an insecticide has essentially the same composition as Schweinfurt green, but owing to the instability of cuprous arsenite part of the arsenic is usually present as arsenate. Commercial Paris green is often grossly adulterated, the percentage of arsenic varying from 10 to 40 per cent.

Verdigris is the name given the bluish-green basic copper carbonate formed on articles of copper or brass exposed to air and dampness. Commercially verdigris green is the ventral acetate of copper, and verdigris blue is the basic acetate, $Cu(C_2H_3O_2)_2$, $Cu(OH).5H_2O$. Both are used as pigments in making oil and water colors.

Copper Ores and their Distribution.—The commercially important ores of copper are, native copper, chalcopyrite, chalcocite, bornite, malachite, melaconite, cuprite, tetrahedrite, and covellite. Other ores are azurite, enargite, atacamite chrysocolla, and domeykite. Native copper, frequently alloyed with native silver, is mined on a large scale only in the Lake Superior region along a belt of rocks belonging to the Keweenawan series of the Algonkian system, extending from the end of Keweenaw Point to near Ontonagon, Mich. The rocks are igneous and sedimentary, the igneous including amygdaloidal diabases and scoriaceous tuffs or "ash-beds," while the copper-bearing sedimentary rocks are the conglomerates.

The mines first worked were on a fissure cutting across the Keweenawan series. These veins sometimes contained masses of native copper weighing many tons, but these masses, since they could not be blasted, as copper is very tough, had to be slowly cut by chisels into pieces large enough for handling. At present there are very few mines working these cross veins, and the great bulk of the production comes from the mines which follow mineralized chutes in the conglomerates or in the "ash-beds." The copper content of these chutes varies greatly; in the Calumet and Hecla conglomerate chute, on which are the Calumet and Hecla and Tamarack mines, the conglomerate has contained, when mined in large amounts, 5 per cent copper; the present content is probably about 3¼ per cent. At the Atlantic mine rock containing but .6 per cent copper is mined and smelted with profit. In the Lake Superior region, as elsewhere, low-grade rock is now mined at a profit that could not have been realized in former years.

By far the most important ore of copper, commercially, and the most widely distributed, is chalcopyrite (copper pyrites, yellow copper ore) a sulphide of copper and iron having the composition expressed by the symbol $Cu_2S.Fe_2S_3$ and containing when pure 34.4 per cent of copper. It is frequently mixed with a very large percentage of iron pyrites, greatly reducing the copper content of the ore. Chalcopyrite is yellow and softer than iron pyrites, but frequently the amount of iron pyrites present as a mechanical mixture is so large that the ore cannot be told from iron pyrites by its color. Chalcopyrite seems to be the ore from which most of the other copper ores have been formed by chemical changes. It is a common thing for mines that show rich copper carbonates and oxides at the surface to show lean chalcopyrite ores at great depths. Chalcocite (copper glance), cuprous sulphide, Cu_2S, contains when pure 79.7 per cent copper, but part of the copper is frequently replaced by iron or some other metal. The percentage of copper rarely falls below 55 per cent, however, and large veins carrying from 60 to 74 per cent of copper have been worked at the great Anaconda Mine in Montana.

Bornite (peacock ore), a sulphide of iron and copper, $3Cu_2S.Fe_2S_3$, contains when pure 55.58 per cent copper, but the proportion of iron and copper present may vary widely without the mineral losing its purplish brown color and beautiful tarnish that shows yellow, green, blue, and purple tints. The copper content may vary from 42 to 70 per cent. The ore is generally regarded as a secondary vein mineral resulting from the decomposition of other copper and iron compounds. Malachite, a basic carbonate of copper, $CuCO_3.Cu(OH)_2$, contains theoretically 57.3 per cent copper, but is usually mingled with carbonates of lime and magnesia, oxides of iron, etc., and very rarely found pure. It is of very frequent occurrence in the upper oxidized portions of copper veins forming the "copper blossom" of the prospector. As thin incrustations on worthless rock a very small amount of it will color a whole mountain-side green. No deposits of sufficient purity to be worked for ornamental purposes occur in the United States, but immense masses have been found in the mines at Bisbee, Ariz.

Melaconite (black oxide of copper), CuO, contains when pure 79.80 per cent copper, but part of the copper is frequently replaced by iron or manganese. It occurs as a secondary product in the upper parts of copper-bearing veins, and is not of very common occurrence, though large bodies of it were formerly worked at Ducktown, Tenn., which contained from 20 to 50 per cent copper.

Cuprite (red oxide of copper) Cu_2O, is a secondary ore, a decomposition product of other ores, and though of more common occurrence than melaconite is chiefly of importance from its notably increasing the richness of veins carrying chiefly iron oxide or copper carbonate Pure cuprite contains 88.8 per cent copper. Some of the mines in Arizona have shown a considerable percentage of cuprite in certain veins worked

Tetrahedrite (gray copper, fahlerz) is essentially a sulphantimonite of copper, containing theoretically 52.1 per cent of copper, but frequently it also contains arsenic, iron, zinc and silver; thus the copper content varies greatly, and from the presence of antimony and arsenic, which make trouble in smelting, the mineral, in the United States, is mined chiefly for its silver contents, an ore of importance in the San Juan region of Colorado. Enargite, a sulph-arsenate, occurs at Butte, Mont., and in Gilpin County, Colo. Atacamite, an oxychloride of copper, is mined on a commercial scale only in the Atacama desert in northern Chile. It occurs in masses of crystals, and contains 59.4 per cent copper. Malachite is usually associated with azurite. This is an ore of importance in Arizona. Its formula, when pure, is $3CuO_2CO_2.H_2O$, and it contains 55.2 per cent of copper.

Of the copper-producing countries, Spain's production comes from the great bodies of low-grade ore, chalcopyrite and pyrite, in the province of Huelva. Of the mines, the Rio Tinto is the most famous. The Spanish deposits were probably worked by the Phœnicians over 2,000 years ago. The Chilean mines are mostly in the province of Antofagasta, and the ores frequently carry silver. Of the mineral atacamite a quantity is mined yearly. The great German mine is the Mansfeld. The copper deposits of the Harz Mountains have been worked continuously for 700 years. The ores are complex, and carry a little silver. There are several large mines in Japan, the largest being the Ashio. The ore is chalcopyrite. The chief producing state in Australia is Tasmania, the ores bornite and chalcopyrite, with pyrite, coming from the large deposits worked by the Mt. Lyell and nearby companies. In Mexico are two important producing centres, one in Lower California, where are the unique deposits worked by the

Boleo Company, and another in Sonora, where large deposits of rich oxidized and sulphide ores have been opened not far from the international boundary. In Canada the great low-grade bodies of pyrrhotite with bornite in the Boundary district of British Columbia promise well.

The copper output of Colorado is largely in the nature of a by-product, since it comes from veins worked or opened for their silver and gold values. Copper deposits occur in Gilpin, Lake, and San Juan counties, the ores being sulphides, chalcopyrite, tetrahedrite, etc. California has some large bodies of pyrite, with chalcopyrite in Shasta County; and in Utah the copper ores near Bingham, in Salt Lake County, are chiefly chalcocite, and carry fair values in the precious metals. Of the eastern and southern States the only important producers are Vermont and Tennessee. The Vermont mines, near Ely, are in veins carrying chalcopyrite and chalcocite; those in Tennessee, near Ducktown, are now working ore that is largely chalcopyrite.

Among the States of the Union Montana owes its pre-eminence in copper-production to the wonderful ore bodies of Butte. These ore bodies, worked for silver at the surface, changed to rich secondary sulphides, while leaner sulphides show in the deep levels of some mines. The ores include chalcocite, bornite, chalcopyrite, enargite, covellite, and tetrahedrite, chalcocite being perhaps the most important; and they often carry considerable silver. The great Arizona copper deposits are near Bisbee, Jerome, and Clifton. At Bisbee the oxidized ores include malachite and azurite, with some cuprite. The principal sulphide is chalcopyrite. At Jerome the ores are bornite, chalcocite, and pyrite, and often carry good values in gold and silver; in fact, the precious metal values of the principal mine in the district, one of the richest in the world, are said to be sufficient to pay all the costs of mining and smelting. At Clifton the ore is chalcopyrite and bornite.

Metallurgy of Copper.— Since the ores of copper vary greatly in composition, and since many contain gold and silver in paying amounts, it follows that the methods of extracting copper differ widely. To describe the chief processes now in use would require more space than can be given here. In general it may be said that high-grade copper ores are smelted direct; low-grade ores, especially if carrying gold and silver, are often smelted; low-grade ores with little gold or silver, in regions where fuel is costly and fluxing scarce, are either concentrated, the concentrates being smelted, or are lixiviated directly. In a way the processes used may be classified as dry, wet, and dry and wet.

The treatment of ores containing less than one per cent copper at a profit in the Lake Superior region is possible because the copper is native, the ore bodies large, and water and fuel can be had cheaply. The rock as it comes from the mines is crushed and sorted, any nearly pure lumps of copper (barrel rock) going directly to the smelter. Rock containing finely divided copper goes from the breaker to steam-stamps, where it is crushed to a fineness of one fourth inch or less. The slimes from the stamps go to concentrating tables, where the particles of worthless rock are washed out; the coarser material goes to jigs by which the particles of copper are concentrated. The final result is "mineral," material containing on the average 60 per cent of copper; and sands and slimes, containing in some mills not over .3 per cent of copper. The "mineral" goes to smelters. The sands and slimes are thrown away.

Smelting copper ores is practically the only process of extraction classified as "dry," and is also by far the oldest method of treating sulphide ores. To trace its development in Germany and England is not possible within the limits of this article. The method developed at Swansea, Wales, had the merit of using a wide variety of ores. It involves: (1) Calcination of the working mixture in a reverberatory furnace by which part of the iron and copper sulphides are decomposed, the sulphur escaping as fumes; (2) smelting the calcined ores with siliceous slags in a reverberatory furnace, by which part of the iron, lime, and several other substances are removed as slag, while the copper, with some of the iron, is run off as matter containing about 33 per cent copper, known as coarse metal; (3) calcining the matte in a reverberatory furnace, by which the amount of sulphur is reduced one half; (4) smelting the calcined matte with slags, or with oxide and carbonate ores, in the latter case the product being white metal, containing 78 per cent copper and 18 per cent sulphur with a little iron and silica; (5) fusing the white metal in a reverberatory furnace, and allowing air to pass over it while liquid, the process being called roasting, and the product blister copper, containing 98–99 per cent copper with a little arsenic, sulphurate, etc.; (6) refining, which is done by melting the blister copper in a special type reverberatory furnace, the sulphur and arsenic being removed by oxidation, while the copper oxide formed is reduced by covering the molten metal with powdered charcoal and sticking in a green birch pole.

Many changes have been made in the smelting of copper ores in the United States and the present practice at such great smelting plants as those at Anaconda, Mont., and Bisbee, Ariz., differs greatly from the Swansea system described. At Anaconda the ore is calcined in large furnaces having various devices for stirring the ore. The calcined ore, with necessary fuel and with fluxing material, if needed, is charged into upright blast-furnaces, usually rectangular in cross-section, and sometimes of large size. A hot blast is used. The wells of the blast-furnaces are water-jacketed. The matte produced is run into trough-shaped "converters," and a blast of air forced through removes the sulphur and most of the other impurities. The resulting black copper is cast into anodes and purified by electrolysis in a bath of copper sulphate, the copper deposited on the cathode being practically chemically pure. The distinguishing feature of American practice is the reduction of labor costs by improvements in devices and methods. In 1902 there were 12 electrolytic copper-refining plants in the United States with a total capacity of 10,120 tons daily; and the plants near New York refine Mexican, South American, and Australian mattes and blister copper that formerly went to Swansea. One of the great advantages of smelting is the recovery of the precious metals with very little extra cost.

Of wet and dry and all-wet methods there are a variety in more or less successful operation in various parts of the world. At Butte some of the ores are crushed and concentrated, the con-

centrates going to the smelter. A large part of the Colorado copper production comes from the concentrates of ores containing silver and gold. Wet processes include: (1) Lixiviation of the ore direct with a solution of ferrous chloride and salt, the copper being precipitated from the solution of cuprous and cupric chlorides by iron; (2) lixiviation of the roasted ore direct with hydrochloric and sulphuric acids, the copper being precipitated as cuprous chloride by sulphurous acid gas; (3) lixiviation of the roasted ore direct with sulphuric acid or with sulphurous acid, the copper being precipitated by iron or, in the case of a sulphuric acid solution, copper sulphate being the final product; (4) gradual lixiviation in heaps. Of the processes named the last is commercially the most important, since it is used at the great low-grade mines of the Rio Tinto district in Spain. The coarse ore is built in heaps 10 to 15 feet high, and 20 feet apart; a fire is lighted in each, and mixed lump and fine ore filled in between, thus a mass of 4,000,000 tons is exposed to sulphurous acid vapors for four to six months, when water is turned on to dissolve the copper sulphate. The percolation and leaching is kept up for about five years, the cupriferous solutions being caught in reservoirs and the copper precipitated by iron.

Electrolytic Refining.—The refining of copper by electricity is very simple in its general outlines, and it is also profitable in cases in which the crude metal contains gold or silver, and the cost of electric power is not too great. Briefly described, the process consists simply in electroplating the metal from one electrode to another, in a solution of copper sulphate; the anode being a plate of blister copper, while the cathode is a similar plate of refined metal. It is found to be possible, in this way, by a proper regulation of the current-strength and of the sizes of the electrodes, to ensure that nothing but copper that is almost chemically pure is deposited upon the cathode; the gold, silver, and other impurities collecting in the bottom of the electrolytic cell as a "mud," which is afterward worked for the recovery of the precious metals. Several methods have been employed for the extraction of copper directly from the ore, by means of a combined chemical and electrolytic process; but these must be regarded as still in the experimental stage.

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Copper, Electrolytic Refining of, a metallic industry, the process of which may best be described by taking as a typical case the great copper refining works at Perth Amboy, N. J. Here, in the course of every month, some 10,000,000 to 12,000,000 pounds of refined copper are deposited in the tank house; and the monthly output from the refining furnaces varies from 15,000,000 to 18,000,000 pounds. The Raritan Copper Works are devoted extensively to the electrolytic refining of the product of the great smelters of the West. The raw product comes to the works in the shape of copper pigs, which measure about 5 inches by 8 inches by 16 inches in length, and whose quality ranges from 95 to 99 per cent pure copper. It receives its first treatment in the furnace house, which consists of three buildings, and the first of which measures 80 by 600 feet and contains four 50-ton anode furnaces and five refining furnaces of the same capacity. The second building measures 80 by 200 feet and contains four 25-ton furnaces; and there is also a blast furnace building. The anode furnaces, as the name implies, are used for melting down pig copper in order that it may be cast into the large flat plates which form the anodes in the depositing tanks. The copper pigs are charged into large reverberatory furnaces, each charge weighing about 100,000 pounds. After about 6 or 7 hours in the furnace the charge is melted, and then for 13 or 14 hours more it is thoroughly worked by methods similar to those used by puddlers in some systems of iron making. The effect of the furnace treatment is to work off some of the impurities, the copper being advanced from 98½ per cent of purity to about 99½ per cent. The slags formed in the furnace treatment by the oxidation of the copper and the impurities combined with the silicious materials forming the sides and bottoms of the furnaces float as scum on the surface of the molten metal. It is skimmed off and sent to the blast furnace to recover the 55 per cent of copper which it contains. After 18 hours' treatment in the anode furnace, the copper is drawn off into a casting machine, which consists of an endless chain of molds, each mold being pivotally carried in and forming part of a conveyer. The tap hole of the furnace discharges into a ladle, from which the metal is poured into the mold. This ladle has a transverse tipping motion and is large enough to hold a charge for one mold, and as much more metal as may run into the ladle while that charge is being poured. The anodes are one inch in thickness, 24 inches in width, and 36 inches in depth. Each is provided on its upper edge with two projecting lugs, which extend over the edge of the depositing tank and serve to support the plate in the electrolyte. The anodes are now loaded on cars and drawn into the tank building. Here they are loaded into frames, each of which holds 22 anodes, which is the total number necessary for each tank.

The tank house contains the whole of the electrolytic plant. It is a single building 200 feet in width and 600 feet in length. The main floor space is given up to 1,600 depositing tanks, which are arranged in four groups of 400 each; and in small additions at the end of the main building are 32 liberating tanks. Four powerful electric cranes for handling the electrodes run the length of the building. The tanks are operated on the regulation multiple system, being arranged

electrically in series, with the electrodes in each tank parallel. The latter are about two feet wide, eight feet long, and three feet deep, and each contains 22 anode and 23 cathode plates arranged in multiple. They are filled with dilute sulphuric acid and sulphate of copper electrolyte, and with a view to securing a constant circulation of the electrolyte the tanks are arranged in sets, with a solution well and a pump to each set. The liquor is drawn from the bottom of one tank and flows over to the next tank below it, the electrolyte being thus brought in thorough contact with the whole surface of the plates in the series of tanks.

The thin cathode sheets which are used in the depositing tanks are formed in what are known as "stripping" tanks, of which there are 180. The cathodes in the stripping tanks consist of rolled plates of pure copper, smeared with grease or plumbago, with their edges protected against the formation of copper by grooved wooden strips. After the cathodes have been in the stripping tanks for 36 hours, they are removed, and the thin sheet of copper is peeled from the plates, the grease serving to prevent any close adhesion of the surfaces. The thin cathode sheets are then flattened out by heating with wooden paddles, and are hung by two thin copper loops, riveted to the plates, from copper rods, the ends of which rest on the edges of the depositing tank. The anodes as they are brought to the tank house from the casting furnace, are hung on special iron frames, on which they are so placed that they will have the proper spacing in the depositing tanks. The traveling crane picks up the frame with its complete set of anodes (22) and places them in position in the tanks, the total weight of the complete set being between four and five tons, while the 23 cathodes together weigh 160 pounds. The action of the current is to transfer pure or practically pure copper from the heavy anode plates and deposit it upon the thin cathode sheets. The latter increase in weight from 6 to 8 pounds to 75 to 80 pounds during the seven days that they are in the tank. At the end of seven days they are withdrawn, loaded on cars, and taken to the refining furnaces. Fresh cathodes are supplied, until the anodes, at the end of 42 or 43 days, have been so reduced as to have to be themselves replaced with fresh anodes.

The product of the tanks, in the shape of heavy deposited cathodes, is taken to the 50-ton refining furnaces, where it is melted down and brought to "pitch," that is, to a purity of 99.88 per cent. In the process of melting the copper takes up a certain amount of oxygen, and this is removed by introducing into the bath of molten metal a pole of green wood the carbon of which combines with the oxygen, and passes off as carbon dioxide. From the refining furnaces the copper is cast into the various forms required by the mills to which the copper is to be shipped. The molds are pivoted at their ends to the links of a conveyer. After each mold is filled with metal, it is drawn through a bath of water, and then tipped over to discharge its contents. The conveyer is operated by a 10-horsepower electric motor, and the ladle is operated by a hydraulic plunger which is under the control of the ladler.

The first process in the treatment of the slimes is to extract the copper, and this is done by boiling the slimes in concentrated sulphuric acid and blowing air through the liquid during the process. The slimes are then washed, dried, and smelted on the hearth of a cupel furnace, and a bullion of gold and silver is recovered. The silver and gold bullion is boiled in large kettles filled with sulphuric acid, where the silver is dissolved and forms sulphate of silver, while the insoluble gold collects on the bottom of the kettle. The sulphate of silver solution is siphoned off into tanks, the bottom and sides of which are lined with copper plates. Here the sulphate is reduced, the silver being precipitated on the copper plates as "sponge silver," which is collected, washed, dried, melted in crucibles, refined, and cast. The gold is collected from the bottom of the kettles and is also washed and refined and cast, the pure silver and gold thus obtained being shipped to the mint.

The power house for the supply of a current necessary for the depositing of 12,000,000 pounds of copper a month is a large one. The boiler room contains eight 400-horse-power and two 200-horse-power Babcock and Wilcox water tube boilers, equipped with the Murphy automatic stoker. The fuel is brought to the boilers, and the refuse, ashes, etc., removed by mechanical conveyers. The engine room contains five vertical cross-compound condensing engines, each direct-connected to a General Electric generator, the largest of which delivers 4,500 amperes at an efficiency of 93.5 per cent.

Cop'peras, the commercial name for ferrous sulphate, or green vitriol. (See IRON.) Copperas occurs native, as the mineral melanterite (q.v.), commonly in connection with deposits of pyrites, from which it is derived by oxidation.

Copper-fastened, a term used of a ship when the bolts and other metal-work in her bottom are made of copper and not iron, so that the copper-sheathing may not corrode the heads of the bolts by galvanic action, which takes place when copper and iron are in contact with sea-water.

Copperfield, David. See DAVID COPPERFIELD.

Copperhead (*Ancistrodon contortrix*), the most widely distributed, and in many places the most abundant of the venomous snakes occurring in the eastern United States. It belongs to the family *Crotalidæ* (q.v.), but with the water moccasin belongs to a genus (*Ancistrodon*), distinguished from the rattlesnakes by the absence of rattles, while the copperhead is peculiar in the presence of a small additional plate between the eye and nostril. The copperhead seldom exceeds a length of three feet. It is brown, with a series of dark blotches on the back, and the triangular head is a bronzy red, from which circumstance it takes its name, while the white color of the interior of the mouth has given rise to another of its names, that of cottonmouth, also applied to the water moccasin. It is sometimes called the red viper. Like other poisonous snakes the copperhead has been exterminated in the thickly settled parts of the northern States, but is still abundant in unsettled regions and in the South. It is partial both to the neighborhood of water and to dry rocky hills and, owing to its activity, its silent approach, and its irascible temper, is justly feared by man and the lower animals, including

non-venomous snakes. Some of the latter, as the blacksnake, will, however, attack and eat it. The customary food of the copperhead consists of small birds and mammals. About seven or eight young are produced at a time, this snake being viviparous; it is said that when pregnant a large number of females will sometimes twine themselves together, whence the epithet "contortrix." As a poisonous snake the copperhead, as well as many harmless American snakes, is sometimes called an adder or viper, though, in common with all related poisonous serpents of North America, it differs from the true vipers in the presence of the preorbital sensory pit. In England adder is the name applied to the only native venomous serpent, the *Pelias berus*.

Copperheads, a name applied in 1862 and throughout the Civil War, to members of the Democratic party in the northern States who violently opposed the prosecution of the War. They were not necessarily in sympathy with the South, but at all events they held that the Confederacy could never be conquered, and that the attempt to coerce the seceding States was hopeless and illegal. The name was generally indicative of a treacherous character, and was a reference to the habit of the copperhead snake, which strikes without warning.

Coppering, sheathing a ship's bottom with thin sheets of copper, to prevent the teredo or ship-worm eating into the planks, and to keep shells and weeds from accumulating on the surface, and so retarding the vessel.

Coppermine River, in Canada, near Coppermine Mountain. It has its source in Point Lake, and flows into Coronation Gulf, an arm of the Arctic Ocean, near Duke of York's Archipelago. Its length is about 325 miles; but the large number of waterfalls along its course render it useless for any travel except by light canoes.

Copper or **Atna River**, a stream in Alaska, rising in the neighborhood of Mount Wrangel, flowing in a generally southern direction west of that mountain, and emptying into the Gulf of Alaska about 30 miles west of Chilkat. The length of the river is a little over 500 miles. Its name is due to the alleged fact that its waters hold copper in solution.

Coppice. See COPSE.

Cop'pinger, John Joseph, American military officer; b. Ireland 11 Oct. 1834. After obtaining a military education in Ireland he went to Rome, serving in the papal army as aide-de-camp. He came to the United States in 1861 and was given a commission in the Union army, rising to the rank of brigadier-general in the regular army in 1895. In the war with Spain, as major-general of volunteers, he commanded the 4th Army Corps in Porto Rico. He married Alice, daughter of the late James G. Blaine (q.v.). He was retired in 1898.

Copra, the dried kernel of the cocoa-nut, from which the oil has not yet been expressed, a considerable article of commerce in some tropical regions. Samoa and the Fiji Islands export more than 10,000 tons annually, Tahiti about 2,000, and Ceylon 3,000 tons. From it cocoanut oil and cocoa butter are manufactured, and the residuum after expression is an excellent fodder, with many of the nutritive properties of cottonseed-oil cake.

Coprolites, the term originally applied to the fossil excrements of extinct animals, especially fishes and reptiles, found most abundantly in the lias, greensand, and Suffolk crag. They consist chiefly of phosphates of calcium (from 50 to 75 per cent) and magnesium, and the carbonates of the same metals, and organic matter, and as the fertilizing properties of these are well known, coprolites have been largely used as a manure. For this purpose they are reduced to powder and used as ground bones, or treated with sulphuric acid, so as to form superphosphate of lime. To the scientist these remains have a definite value as indicating the prey of the animal in question and the nature of its intestinal structure.

Copse, kŏps, a cultivated wood, where the trees are cut periodically, before they attain timber size, each succeeding crop being cut from the stumps of the first growth. A copse or coppice is sometimes used as an ornamental growth, where large trees would not be desirable, but their chief use is as a source of profit. When cultivated under the rules of scientific forestry, they may be made a very valuable adjunct to the farm lands. The practice is not common in America, where the idea of profit from woodland is that the land must be allowed to grow up to timber, and then be entirely denuded. In Europe, particularly in England, the most valuable tree thus employed is the oak, which is cut at intervals varying, according to soil and climate, from 12 to 30 years; and after paying all expenses it often yields from $150 to $250 per acre in bark used for tanning, and in wood convertible into wheel-spokes, or applicable to other purposes. The stems, cut over near the ground, are carefully dressed and rounded, so as to prevent them from rotting; in a short time a number of shoots appear, all of which are thinned away except three or four of the most promising, which are left to grow till they again become fit for another cutting. When plantations are extensive, the method usually followed is not to allow all the copse to come to maturity at the same time, but to divide it into a number of sections and to cut one of them annually, so as to yield a revenue with as much regularity, and not unfrequently to as large an amount, as an equal quantity of land under cultivation. For instance, a copse of 100 acres, on the assumption that it may be profitably cut after 20 years' growth, is divided into 20 sections of five acres each. By cutting only one of these sections annually a perpetual succession of cuttings is obtained, yielding, on the most moderate calculation, a clear income of at least $500 per annum. The proprietors of many of the rocky glens of Great Britain, by pursuing this method, have materially increased the value of their estates. The other kinds of wood commonly used for copse are chestnut, which, from its durability, even when partly inserted in the ground, is valuable for posts, etc.; ash, preferred for all purposes where strength and elasticity are required; and hazel, admirably adapted for barrel hoops, and in great demand for crates in the vicinity of potteries. The willow, well known for its uses in basket-making, being cut down regularly after every year's growth, scarcely falls under the head of copse. In some continental countries the copse is the source of the whole fuel supply.

Coptic Languages, the language formerly spoken by the Copts or Egyptian Christians, and regarded as the direct descendant of the ancient sacred language of the Egyptians. As such it has afforded to Champollion, Dr. Young, and others the key to the interpretation of the Egyptian hieroglyphic inscriptions. At the time of the introduction of Christianity among the Copts the hieroglyphic, hieratic, and demotic modes of writing previously in use in Egypt were abandoned, and the Greek alphabet was adopted, with the addition of six characters of the demotic alphabet, which were retained because the equivalents to them were wanting in the Greek alphabet. These six letters represented *kh, h, f,* the English *j,* and two forms of *sh.* By the time that this change was made the Coptic language was no longer the same with the ancient sacred language, but had adopted a number of words from the vernacular language, which was spoken in Egypt alongside of the former, beside a large number of others from the Greek, the Latin, the Arabic, and other sources. It still remained, however, essentially Egyptian. The Coptic language is monosyllabic in character. All its radical forms are monosyllables, and whenever a polysyllabic word is met with it may be at once affirmed that the word is either a derivative or a compound. As a rule the radicals are capable of certain modifications of form, which always express a modification also of the sense. The meaning of the radical monosyllables is in fact changed by the juxtaposition of other monosyllables, which are the usual signs of genders, numbers, persons, moods, and tenses. The feminine is sometimes formed by a modification of the vowel of the masculine. In the Coptic root syllables there are often final consonants which do not form part of the root. These are called paragogic letters, and can only be explained as instances of the caprice of pronunciation, or as being originally part of the root both in spelling and pronunciation, although in course of time they have been dropped so far as the pronunciation is concerned. According to the German philologist, Schwartze, the Coptic may be taken as forming a family of languages analogous to the Semitic in its grammar, and allied to the Indo-European languages in its roots. This opinion is supported by various other philologists, such as Bunsen, Meier, and Bötticher, but it is contested by others, among them Pott, Ewald, Wenrich, and Renan. The Coptic language is divided into three dialects — the Theban, which was spoken in Upper Egypt, and which is the best preserved of the three; the Memphitic, or Coptic, strictly so called, which was spoken in Lower Egypt; and the Bashmuric, which was spoken in the Delta. Of the last the literary remains are very scanty, but it is that which comes nearest to the hieroglyphic language of the ancient Egyptians. After the Arabian conquest of Egypt the Coptic language gradually ceased to be spoken, and as early as the 10th century it was no longer in use in Lower Egypt, except in their church liturgies; in Upper Egypt, however, it maintained itself for some centuries longer, but here also it was at last obliged to give way to the Arabic. The theological writings in use among the Coptic Christians, however, are still written in the Coptic language, but an Arabic translation always accompanies them. In the schools the children learn the Gospels and the epistles of the New Testament in Coptic as well as Arabic, but they are no longer taught the former language grammatically. In the various libraries of Europe there are numerous Coptic manuscripts, but most of them are of little interest. The Coptic literature is almost entirely of a religious character, the works written in it comprising portions of the Old Testament, the Acts, sermons and homilies, martyrologies, etc. Translations of the Pentateuch and some other books of the Old Testament and of the Gospels into Coptic have been published at Rome. Materials for the study of the Coptic language will be found in the grammars of Schwartze (Berlin 1850), Uhlemann (Leipsic 1854), and Stern (Leipsic 1880), and the dictionaries of Peyron (Turin 1835, still considered the best) and Parthey (Berlin 1844). Consult: Loret, 'Manuel de la Langue Égyptienne.'

Coptine, a colorless alkaloid which is found together with berberine in the root of *Coptis trifolia.* Coptine dissolves in sulphuric acid, the solution becoming purple-red when heated; it gives a crystalline precipitate with a solution of mercuric potassium iodide.

Cop'tis, a genus of low herbs of the crowfoot family (*Ranunculaceæ*). It comprises about nine species occurring in the cooler parts of the northern temperate zone. Four species are found in America, three of them on the Pacific coast. *C. trifolia,* gold-thread, or canker-root, grows in damp woods and bogs from Newfoundland to Maryland, and westward and north to Minnesota, British Columbia, and Alaska. In the Adirondacks its evergreen leaves are found at an elevation of 3,500 feet. Its common name of canker-root is given to it because of its use in household medicine as a cure for cankerous affections of the mouth in children. A yellow dye is extracted from the root-stock. *C. teeta* is used in India as a tonic.

Copts, a name given to the schismatic Christians of Egypt who are of the Monophysite sect, similar in belief with the Jacobites of Asia. The Monophysites and Jacobites are followers of Dioscorus, Patriarch of Alexandria, who was deposed by the council of Chalcedon in 451, because he maintained there was only one nature in Christ. The Copts were of pure Egyptian blood, and at first were more numerous than their adversaries, the Melkites, who were Greeks in origin and believers in Christ as taught by the Church. Officials who were considered orthodox were sent from Constantinople to govern Egypt, and many of the Copts fled to Upper Egypt and some went to the Arabs. So incensed were they with their rulers that when an opportunity occurred, they betrayed their country to the Saracens, who drove the Greeks and Romans out of the land. But the Copts soon found that their privileges would be of little avail, and their wealth, numbers, and respectability rapidly declined, and though rarely intermarrying with their conquerors, and preserving their features, manners, and religion unaltered, they soon lost their language, which had resisted the influence of a Grecian court for so many ages. In person and features the Copts differ much from the other natives of Egypt, and are evidently a distinct race. According to the younger Champollion they are the result of a mixture of all the different races that have

ruled over Egypt. Reduced by a long course of oppression and misrule to a state of almost degradation their number and national character have declined, so at the highest calculation they do not now amount to more than between 150,000 and 100,000, or one tenth of the population, although at the time of the Saracen invasion their number is said to have reached 600,000. Their costume resembles that of the Moslems, but they are in the habit of wearing a black turban for distinction's sake. They also commonly wear a black or dark-colored outer robe. In their general customs there is little to distinguish them from the other inhabitants of the country. They are chiefly employed as clerks, secretaries, etc. The women go out with veiled faces, like the other females of the country. They have numerous schools for their male children, but very few of the females are taught to read. In doctrine they agree almost wholly with the Roman Catholic Church, except on the one point which caused the separation,—the two natures in Christ. They celebrate Mass in the old Coptic language, as with them now the Arabic is the common tongue. Their supreme head is the Monophysite Patriarch of Alexandria, who is chosen from among the monks; then come the bishops, priests, deacons, inferior clergy, and monks. The priests may be married according to the Eastern discipline, and as they receive but little by way of support from their congregations, they are generally engaged in the ordinary occupations of the place in which they live (see JACOBITE CHRISTIANS; MELCHITES). They have four seasons of fasting, all of which are scrupulously observed. Their Lent begins nine days earlier than that observed by the Roman Catholic Church. The doctrine of the sacraments does not vary from that of the Latin Church, but they have a peculiar ritual in the administration of the sacrament of extreme unction, which they give with the sacrament of penance, even when there is no bodily illness, to heal the disease of the soul. The curious custom exists of blessing the bathing water stored in large tanks; and to appease or please the Mohammedans, they have adopted circumcision. Within recent years a large body of the Copts made corporate reunion with the Roman Catholic Church, and there is a Catholic Vicar Apostolic of the Coptic rite for the Copts of Egypt.

Copway, George, native name, Kah-ge-ga-gaw-bowh; Indian journalist: b. Michigan 1818; d. about 1869. He belonged to the Ojibway tribe and was settled in New York. He wrote: 'Recollections of a Forest Life'; 'The Ojibway Conquest,' a poem; 'Running Sketches of Men and Places in Europe,' etc.

Copy (Lat. *copia*, "abundance"). (1) In ancient times, when the art of printing in its improved form was unknown, the copyist was a much esteemed person, and manuscript was multiplied by the laborious process of writing by hand. Some of the Roman slaves were copyists. From the early centuries of Christianity through the Middle Ages, and until the art of printing became popular, there were in each monastery certain monks who were copyists. Their whole time was occupied with transcribing manuscripts of the ancient classics, the writings of the fathers and doctors; but their chief care was the making copies of the Bible. Often days were spent upon ornamenting an initial letter or in decorating the names of the Deity. The preservation of the Bible in its present form, and of ancient classics in general, is due to the faithful work of the old copyists. Copies of books in those days were of great value, often they were carried under guard from place to place when the owner was traveling, and the copy of the Bible was usually chained in the parish church. (2) The matter, whether in print or manuscript, sent to the printer to be set up in type. (3) An exact reproduction of a work of art made by one other than the original artist; a copy made by the original artist is called a replica.

Copyhold, in English law, a tenure of estate by copy of court roll, or a tenure for which the tenant has nothing to show except the rolls made by the steward of the lord's court. Copyhold property cannot be now created, for the foundation on which it rests is, that the property has been possessed time out of mind, by copy of court roll, and that the tenements are within the manor. Copyhold does not exist in the United States. Consult Scriven, 'Treatise on Copyhold, Customary Freehold,' etc. (7 ed. 1896).

Copying, a term in general use for a great many different processes, which may be described generally as the reproduction, usually either on an enlarged or reduced scale, of any drawing, map, or other work of art. A few of the methods employed may be shortly described. If the copy is to be the same size as the original, the easiest way is to trace it. A piece of tracing-paper is put over the drawing, and the principal lines gone over with pencil. The back of the tracing is then rubbed with black lead or ruddle, and put on the paper on which the copy is to be made; the traced lines are gone over with a hard point, and thus indicated on the paper. Guided by the traced lines, the copy can then be drawn in. When the copy is required of a different size from the original, the simplest way is to sketch it by hand and eye, but where more mechanical accuracy is required, the method of squares is very useful. The original is covered with squares of any convenient size by pencil lines or threads or by tracing paper ruled off in squares; a piece of paper for the copy is prepared with a corresponding number of squares, of a smaller or larger size, according as the copy is wanted smaller or larger. These squares must bear the same proportion to the squares on the original as the copy is to bear to the original. It is then a comparatively easy matter to copy in each square the part of the original in the corresponding square. To avoid confusion if the squares are small, it is well to number them along each side of the drawing. Any drawing consisting principally of straight lines, such as a plan, can be conveniently reduced by constructing a scale to suit the reduced size required. The lines of the original are measured by its scale, and the same proportion of the smaller scale gives the necessary measurement. The pantograph is another means of making a reduction or enlargement, but is very seldom used now. It is only accurate in a general way. Perhaps the simplest and most exact method is to get the original photographed to the required size; the copy can then be traced on to clean paper as already described.

The copying of letters and other documents for commercial purposes is usually done by means of the ordinary copying-press, which is so familiar in every counting-house as to need no detailed description. A letter written with specially prepared ink is transferred to another piece of paper by means of damp and pressure. Common ink thickened with a little sugar will serve as copying ink. Many modifications of this arrangement have been devised for producing a number of copies of circulars, etc., from one written copy, and are known as "graphs." A document written with the ink prepared for the purpose is transferred by pressure with the hand to a gelatinous slab, from which as many as 50 or 60 copies, more or less distinct, can be retransferred by rubbing with the hand. A very useful method of manifold writing is largely employed in telegraphic news work, and for duplicating invoices by retail tradesmen. Carbonized paper is put between two, three, or more sheets of thin paper, and thus whatever is written on the top sheet with a hardish pencil is duplicated on the others. When an indefinite number of copies of any drawing or other subject is required, there are many printing processes which may be employed. Letters or circulars, if written with lithographic ink, can be transferred to stone, and any number printed. Engineers' or architects' drawings, or any other drawing executed in line, can be very successfully reproduced in any size by the photo-lithographic process. If required for block or letterpress printing, then any of the zincotype processes may be employed. By this process, also, plates to reprint steel-engravings can be produced from any printed engraving. For reproducing drawings executed otherwise than in line, photographs from nature, or paintings, there are many other processes.

Copying Machine, any one of a number of contrivances by which one or more copies of a letter or other document may be made. Perhaps the best known is the copying-press. The letter is written with "copying ink," a writing fluid containing some gummy substance which prevents the ink from soaking into the paper. A sheet of bibulous tissue paper moistened with water to a certain degree is laid on the face of the writing, a sheet of oiled paper is laid on the tissue paper, and the letter is placed between boards and put into a press, the platen of which is screwed down tightly. A few seconds' contact of the damp tissue paper with the writing transfers sufficient of the ink from the original to the tissue to make a perfect copy. A number of letters similarly treated may be copied by one operation of the press, and by the use of very thin tissue and longer impression three or four good copies of a letter may be taken. Among copying processes are many that are perhaps rather methods of reproduction in bulk instead of copying in a more limited way, being somewhat akin to printing. Among these are lithography (q.v.) and the mimeographic process. See MIMEOGRAPH.

Copyright, the exclusive right of property in any intellectual production; the protection afforded by the law for a limited number of years to the originator of any written or printed composition or work of art, or to his heirs and assigns, whereby persons unauthorized are prevented from multiplying and selling copies, or, in case of dramatic works, from representing them on the stage. Such rights were claimed by authors before the introduction of printing. After the invention of the printing press, the right to publish books became the subject of licenses and patents. In Chambers' 'Domestic Annals of Scotland,' under date of 9 Nov. 1699, may be seen a warrant of the Privy Council authorizing George Mossman, stationer in Edinburgh,—

—"to print and sell the works of the learned Mr. George Buchanan, in one volume in folio, or by parts in lesser volumes, and forbidding all others to print, import, or sell the whole or any part of the said Mr. George Buchanan's works, in any volume or character, for the space of 19 years."

Similar privileges were granted in England; but all such monopolies were regarded with suspicion by common lawyers. The common law affords a certain measure of protection to works unpublished or published only for a limited purpose. The writer of a letter, for example, transfers his property in it to the receiver; but the receiver has no right to print it for sale or distribution without the writer's consent. The copyright in published works is the creation of statute; the first copyright act was passed in 1709; and by virtue of its provisions authors acquired the sole liberty of printing their books during a term of 14 years from first publication, and, if the author should be living at the end of that time, during a further term of 14 years.

While this act was in force, Thomson sold the copyright of his poems to Millar, a London bookseller. Millar claimed the right to prevent the issue of reprints by Donaldson (of Edinburgh) and others, even after the statutory term had expired, on the ground that an author had, at common law, the sole right of printing his works. Out of this dispute arose the famous cases of Millar *v.* Taylor, and Donaldson *v.* Beckett, which led to a remarkable difference of opinion among the judges. The House of Lords decided that if any common-law right existed it had been taken away by statute.

At the union with Ireland, the copyright act was extended to that country, and the trade in cheap editions printed in Dublin and secretly imported into Great Britain came to an end. In 1814 the term of copyright was extended to 28 years, and the residue of the author's life if he were living at the end of the term. The impetus given to literature at the beginning of the 19th century, and especially the popularity attained by the works of Scott and Byron, greatly increased the market value of copyright, and ultimately led to further legislation in the interest of authors and publishers. The basis of the existing law is the copyright act of 1842, commonly known as Talfourd's Act, or Lord Mahon's Act. Macaulay's speech in the House of Commons on the second reading of this measure is one of his most successful parliamentary efforts. In Great Britain the term of copyright in a book is 42 years, or the life of the author and seven years, whichever of the two terms is the longer. No copyright can be enjoyed in seditious or immoral publications, or in books first published out of the United Kingdom. Articles contributed to encyclopædias and periodicals and books published in parts or series belong to the proprietor; but he may not publish them separately without the writer's consent, and after 28 years the copy-

right reverts to the author. Dramas and musical pieces, if first published in book-form, are subject to the same rules as books; but if they are performed in public before appearing in print the author retains the sole right of permitting them to be represented during the term of copyright; and this right is distinct from the copyright he acquires if his drama or piece is published as a book. By an act of 1882 the proprietor of a piece of music, desiring to reserve the right of performance, must give notice to that effect on the cover. Verses may not be taken from a copyright work and set to music for sale, without permission. A novel may be dramatized without the author's permission; but if copies of the drama are published containing passages borrowed in substance from the novel, the author of the adaptation is liable to an action. The right to dramatize can be exercised only with precautions which must greatly restrict it in practice.

Copyright in engravings, maps, etc., is secured by several acts; the term is 28 years. Each plate and print must bear the name of the proprietor. Copyright in paintings, drawings, and photographs is secured to the artist during his life and seven years after, by an act of 1802. In 1874 the Canadian Copyright Act enabled a British author to obtain copyright in Canada for 28 years, provided his work be published in the colony. This right is concurrent with and in addition to the rights given by the imperial act of 1842.

Section 4,952 of the Revised Statutes of the United States, in force 1 Dec. 1873, as amended by the act of 18 June 1874, as amended by the act of 3 March 1891, provides that the author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, print, or photograph, or negative thereof, or of a painting, drawing, chromo, statuary, and of models or designs intended to be perfected as works of the fine arts, and the executors, administrators, or assigns of any such person, shall, upon complying with the provisions of this chapter, have the sole liberty of printing, reprinting, publishing, completing, copying, executing, finishing, and vending the same; and, in the case of a dramatic composition, of publicly performing or representing it, or causing it to be performed or represented by others. And authors or their assigns shall have exclusive right to dramatize or translate any of their works for which copyright shall have been obtained under the laws of the United States.

A printed copy of the title of the book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or chromo, or a description of the painting, drawing, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be delivered to the librarian of Congress or deposited in the mail, within the United States, prepaid, addressed "Librarian of Congress, Washington, D. C." This must be done on or before day of publication in this or any foreign country. Not later than the day of publication in this country or abroad, two complete copies of the best edition of each book or other article must be delivered or deposited in the mail within the United States, addressed "Librarian of Congress, Washington, D. C.," to perfect the copyright. The freight or postage must be prepaid or the publications enclosed in parcels covered by printed penalty labels, furnished by the librarian, in which case they go free by mail (not express), without limit of weight, according to the rulings of the post-office department. Books must be printed from type set in the United States, or plates made therefrom; photographs from negatives made in the United States; chromos and lithographs from drawings on stone or transfers therefrom made in the United States. Without the deposit of copies above required, the copyright is void and a penalty of $25 is incurred. The law requires one copy of each new edition wherein any substantial changes are made to be deposited with the librarian of Congress.

No copyright is valid unless notice is given by inserting in every copy published, on the title-page, or the page following if it be a book; or if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing on some portion thereof, or on the substance on which the same is mounted, the following words, "Entered according to Act of Congress in the year ——, by ————————, in the office of the librarian of Congress, at Washington," or, at the option of the person entering the copyright, the words: "Copyright, 19—, by————————." The copyright law secures to authors and their assigns the exclusive right to translate or to dramatize any of their works; no notice is required to enforce this right. The original term of copyright runs for 28 years. Within six months before the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of 14 years, making 42 in all. In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright must be entered for each volume or part of a book, or number of a periodical, or variety as to style, title, or inscription, of any other article. To complete the copyright on a book published serially in a periodical, two copies of each serial part, as well as of the complete work (if published separately), should be deposited.

To secure copyright for a painting, statue, or model, or design intended to be perfected as a work of the fine arts, a definite title and description must accompany the application for copyright, and a mounted photograph of the same, as large as "cabinet" size, mailed to the librarian of Congress not later than the day of publication of the work or design. The fine arts, for copyright purposes, include only painting and sculpture, and articles of merely ornamental and decorative art should be sent to the patent office; as subjects for design patents. Copyrights are not granted on trademarks or on names of companies, libraries, or articles, or on an idea or device, or on prints or labels intended to be used for any article of manufacture. If protection for such names or labels is desired, application must be made to the patent office.

Until 1891 copyright could be acquired only by a citizen of, or permanent resident in, the United States. British authors had much reason to complain of this state of the law; and American authors were injured by having to compete with cheap unauthorized reprints of

British works. There was at one time an understanding that the American publisher who first placed a British work on the market obtained copyright by courtesy; and considerable sums were paid for "advance sheets" in order to obtain this advantage, but the "courtesy of the trade" came to be disregarded. In December 1887, the convention of Berne brought nearly all the States of Europe into copyright relations with one another. This was the most important step ever taken in the history of the world's literary dealings, for it secured an almost universal recognition of the rights of authors. The rights of citizens or subjects of a foreign nation to copyright in the United States extend by presidential proclamations to Great Britain, France, Belgium, Switzerland, Germany, Italy, Spain, Denmark, and Portugal, and Americans can secure copyright in those countries. For this direct arrangements must be made abroad. For an American citizen to secure copyright in Great Britain the title should be entered at Stationers' Hall, London, the fee for which is five shillings sterling, and five shillings additional if a certified copy of entry is required. The work must be published in Great Britain or in her dominions simultaneously with its publication in the United States, and five copies of the publication are required, one for the British Museum and four on demand of the Company of Stationers for four other libraries. Copyright may be secured in France by a foreigner by depositing two copies of the publication at the ministry of the interior at Paris. No fee or entry title required. To secure copyright in Belgium a foreigner may register his work at the department of agriculture, industry and public works at Brussels. In Switzerland, register of title at the department of commerce and industry at Berne is optional, not obligatory; fee, two francs. If registered, deposit of one copy is required. Copyright in Canada is to be registered with the minister of agriculture at Ottawa; fee, $1 for registry and 50 cents for certificate, and the work must be published in Canada and two copies deposited. In Greece the period during which an author can hold a copyright is restricted to 15 years. The Swiss grant copyright during the life of the author or his heirs during 30 years from the date of publication of his work. In Brazil the author enjoys a copyright for life, and it is extended for 10 years after his death. In Venezuela the copyright endures for the life of the author and 14 years after his death. In Holland and Belgium the copyright lasts during the life of the author and during 20 years after his death. In Germany, Austria, Hungary, and Portugal copyright endures during the life of the author and during 30 years after his death. The duration of copyright in Italy is regulated in a peculiar manner. It endures for the life of the author and 40 years after his death, or for 80 years after the publication of the work, the term of years being divided into two periods of 40 years each. If the author dies within the first period of 40 years the remainder of the term is enjoyed by his heirs or assigns. The second period of 40 years begins at the death of the author, if he has died after the first period of 40 years has elapsed; or if he has died before them, at the end of the first period of 40 years. During the second period any one is at liberty to republish the work on payment to the owner of the copyright of a royalty of 5 per cent on the price, which must be marked on the book. France, Norway, Sweden, and Denmark accord a copyright during the life of the author and 50 years after his death. Russia not only gives copyrights for life and 50 years after death, but also for 10 additional years if an edition of the work is published within five years from the end of the first copyright term. The law of Spain accords a copyright during the life of the author and for 80 years thereafter. Only in Mexico is copyright perpetual, but at the present time an effort is being made to have copyrights perpetual in various countries. Consult Drone, 'The Law of Property in Intellectual Productions'; Putnam, 'The Question of Copyright.'

GEORGE HAVEN PUTNAM.

Copyright, Canadian. The double relation of Canada, as at the same time a self-governing nation, and also a part of the British Empire, produces some slight complications in its copyright law. By the British North America Act of 1865, constituting the Dominion, the power of copyright legislation was assigned to the Federal authority. The Canadian Parliament passed a Domestic Copyright Act in 1875, revised it in 1886, and amended it in 1889 by an act which was suspended by the Imperial Parliament, pending discussion of the protection of British authors. Finally in 1895 a Canadian act satisfactory to both British authors and the Canadian printers and publishers was agreed on and passed. The Imperial Copyright Act of 1842 applies generally to Canada, subject to the present Canadian legislation. The importation of foreign reprints of British copyright works was formerly permitted on payment of a 12½ per cent royalty duty collected through the Canadian Customs, but since this has been dropped from the tariff, it has been held (re Morang vs. Publishers' Syndicate, 32 Ont. Rep.) that the prohibition of such importation contained in the Imperial Act applies once more to Canada in favor of the properly registered British copyright holder. The point is not however free from dispute.

The difficulties have chiefly arisen from the importation into Canada from the United States of reprints of British works sold at low prices, and which it has been practically almost impossible to restrain. When these were so imported by American publishers under agreement with the British author, the Canadian printer and publisher saw themselves constantly deprived of business which they considered should be theirs, as no reciprocity was permitted them by the United States. Their mouthpiece was the Canadian Copyright Association and their agitation was continuous. The refusal of the United States to enter the Berne Convention was an important incident in the history of the trouble, although more recent United States legislation protects the British author to a certain extent. The Canadian author also has found it necessary to watch copyright legislation and raise some complaints. At present any author domiciled in the Empire, or in any country having an international copyright treaty with the United Kingdom, may obtain copyright in Canada for 28 years (renewable for 14 years by the author, his widow or children) of any book, map, chart, musical composition, or any original painting, drawing, statue, sculpture or

photograph, any print or engraving of an original design, or any translation of a literary work, but no exclusive right can be obtained to illustrate a piece of scenery or an object. The work must be printed and published, reprinted and republished or produced or reproduced in Canada. The copyright lapses with the expiration of foreign copyright. British copyrighted works may be copyrighted when printed and published, or reprinted or republished in Canada, and may also be imported notwithstanding Canadian copyright. Works published in separate articles of a periodical may be temporarily copyrighted, but the complete work must also be registered when published. Anonymous works may be registered in the publisher's name. The registration is granted on delivery of three copies of the work at the Department of Agriculture (Copyright Branch), Ottawa, immediately on publication in Canada, and the issued work is to bear copyright notice in due form. An interim copyright may be obtained, but becomes void unless the work is printed in Canada within one month after first publication elsewhere. If not so printed, the applicant is liable to a penalty of $100. All communications are addressed to "The Minister of Agriculture (Copyright Branch), Ottawa," from whom copies of the act and regulations may be obtained on request.

Any publication of an original manuscript, without consent of author or proprietor entrains liability for damages, unless the work be already printed in Canada or elsewhere. If the copyright edition is out of print the minister may, after a complaint made to the proprietor, and his neglecting to provide a remedy, grant licenses to others to publish, and may fix the royalty.

Foreign magazines and newspapers, containing British copyright works, may be imported, if the publication is with the author's consent, or under the copyright law of the country from which they come. Volumes of collections containing in part literary matter or music copyrighted in Canada, cannot be imported except from the United Kingdom.

WILLIAM DOUW LIGHTHALL,
Fellow Royal Society, Canada.

Coquelin, Benoit Constant, bē-nwä kôn-stäṅ kōk-läṅ, French actor: b. Boulogne 23 Jan. 1841. He early showed such talent that he was admitted to the Paris Conservatoire in 1859, the following year took the second prize for comedy, and made his début on the stage of the Théâtre Français, 7 Dec. 1860, as Gros-René in the 'Amourous Veration.' Later he appeared with great success in 'Le Marriage de Figaro,' 'Le malade imaginaire,' 'Le misanthrope,' 'Le barbier de Séville,' and other pieces in the classical repertoire. His versatility was considered remarkable, as he was no less effective in modern plays, and he speedily became a popular favorite. He was elected a sociétaire in the Théâtre Français in 1864, but in 1886 he retired and made an extensive tour abroad. He made his first visit to America in 1888. About the end of 1889 he rejoined the Théâtre Français company as a salaried member and remained with that organization until 1892. In 1893–4 he again appeared in the United States. Upon his return to Paris he formed an engagement with the Renaissance Theatre, which led to a lawsuit with the Comédie Française in which Coquelin was condemned to pay damages. In 1900–01 he visited America again, in company with Sarah Bernhardt (q. v.), to whose Duke de Reichstadt he played Flambeau in Rostand's 'L'Aiglon.' Among the many characters created by M. Coquelin in later years are those of Labussière in 'Thermidor,' Cyrano de Bergerac in Rostand's play of that name, and Napoleon in 'More than Queen.' Together with his high rank as a comedian M. Coquelin has become celebrated as an author and lecturer, among his publications being 'L'Art et le comédien' (1880), which has been translated into German and into English (as 'The Actor and his Art'); 'Les comédiens, par un comédien' (1882), and 'L'Arnolphe de Molière' (1882).

Coquelin, Ernest Alexandre Honoré, ėr-nā ä-leks-andr ō-nō-rā, French actor; brother of Benoit Coquelin: b. Boulogne 16 May 1848. He was educated at the high school of his native city and was for a time in the employ of the Northern Railway, but following in the footsteps of his brother went to Paris in 1864 and entered the Conservatoire, to make a career upon the stage. He was graduated three years later with the first prize in comedy and made his début at the Odeon. In 1868 he became associated with his brother at the Théâtre Français, and continued there until 1875, playing in all the well-known classical comedies. He took an engagement at the Variétiés in 1875, but returned to the Théâtre Français in the following year, shortly after becoming a member of the company. M. Coquelin, Cadet, as he is called, to distinguish him from his greater brother, is the author of numerous monologues, to the success of which he owes most of his reputation, and his rendering of them has gained him great popularity in Paris.

Coquelin, Jean, zhōṅ, French actor: b. 1 Dec. 1865. He is a son of B. C. Coquelin (q.v.), and adopting his father's roles appeared at the Comédie Francaise for the first time, 20 Nov. 1890.

Coquerel, Athanase Josué, ä-ta-näz zhō-sü kō-kē-rĕl, French Protestant clergyman: b. Amsterdam 16 June 1820; d. Fismes, Marne, France, 24 July 1875. He was a son of A. L. C. Coquerel, and was the author of 'Jean Calas et sa famille' (1858); 'Libres études' (1867), etc. He was widely known as an eloquent preacher, and was long a leader of the liberal Protestant party in France.

Coquerel, Charles Augustin, shärl ô-güs täṅ, French theologian: b. Paris 17 April 1797; d. there 1 Feb. 1851. He was a brother of A. L. C. Coquerel, and among his writings is 'L'Histoire des eglises du desert' (1841).

Coquilla Nut (Sp. *coquillo*, "little cocoa nut"), the seed of the piassava or piacaba palm, *Attalea funifera*, one of the cocoanut group, a native of Brazil. The nuts are three or four inches long, oval, of a rich brown color and very hard, and are used in turnery for making umbrella handles, etc.

Coquimbo, kō-kēm'bō, Chile, a province situated in the northern part of the republic, between the provinces of Atacama and Aconcagua. Area 12,896 square miles. It is divided into the departments of Serena, Elqui, Coquimbo, Illapel,

Ovalle, and Combarbalá. The principal towns are: La Serena, the capital (pop. 16,500); Coquimbo, the principal seaport of the province, which is one half hour by rail from the capital, and has 10,000 inhabitants; Ovalle (5,500); Elqui (2,500); Illapel and Combarbalá. Gold, silver, copper, iron, quicksilver, lapislazuli, and lime are found. There are four large copper-smelting establishments, and several others for silver and gold ore. Natural pasturage is abundant. Agricultural products in excess of the needs of the province are exported in considerable quantities. Vineyards are located near the mountain range, and wines and brandies are produced. Two lines of railway belonging to the government and one belonging to a private company are in operation; the total length of the government lines being about 200 miles. There are telegraph and telephone services throughout the province, and at La Serena and Coquimbo are offices of the submarine cable. Pop. 175,000.

Coquimbo, Chile, a seaport. See COQUIMBO, a province.

Coquimbo. See BURROWING OWL.

Coquina, kō-kē'na, a porous rock found in Florida, where it is used for building purposes. It is composed of the broken shells of sea-animals, and coral cemented together.

Cor Anglais, kor än-glā (Fr. "English horn"), a wind instrument of the reed kind, similar to the oboe, and possessing a compass of like extent but of lower pitch. Its compass is from E in the bass to B flat above the treble staff. In Bach's works it appears as the Oboe di Caccia. Its effective wailing tone has caused it to be used by modern operatic composers.

Coraciiformes. See PICARIÆ.

Coracle, kŏr'a-kl, or **Currach** (Ir. *curach;* W. *corwc*, a kind of ancient boat, constructed with a frame or body of wicker-work, and still in use among Welsh fishermen and on the Irish lakes. It is covered by skins, oil-cloth, etc., which are removed when out of use. It is of an oval form, and generally contains but one man, who, on reaching the shore, shoulders his coracle, and deposits it in a place of safety, or carries it perhaps where he may again make use of it. Cæsar (De Bello Civili, i. 54) describes coracles which he made after the British model for use in Spain. The coracle or currach in mentioned in the lives of St. Patrick, St. Columba, and in accounts of travels made by Scots and Picts.

Coracoid, kŏr'a-koid (Gr. "crow-shaped," that is like a crow's bill), an important paired-bone in the breast-girdle, forming along with the scapula, the articulation for the forelimb, and always lying ventrally. In the lower fishes the entire girdle is cartilaginous. In the bony fishes distinct coracoids first appear. They are well seen in *Amphibia* and in all reptiles except snakes, and are very large and strong in birds; but they become mere processes of the scapula in mammals. They very often exhibit a special anterior portion known as the precoracoid.

Coral and Coral Islands, the solid support or skeleton of the coral polyps (see POLYPS). It was formerly supposed that the coral was a calcified portion of the soft parts of the animal, but this has been disproved. Recently Bourne has proved by the examination of both alcyonarian and madreporarian corals that the skeleton is formed as a secretion by certain cells and that there is no deposition of crystalline carbonate of lime in the actual cells. The calcareous septa or partitions are deposited by the soft septa of the animal in the radial chambers. The coral particles begin to be deposited in the embryo polyp before it becomes fixed to the bottom. In the very young polyp of the Mediterranean Astroides, as soon as it becomes stationary 12 calcareous partitions are deposited, and these enlarge and finally become jointed to the external walls (theca) of the coral, forming a groundwork or pedestal, on which the young polyp rests, as if on a limestone foundation. If isolated needles or rods of lime are distributed beneath the outer layers of the polyp-stock, the latter becomes horny or leathery and more or less flexible, as in the alcyonarian polyps. The entire skeletal mass is called the corallium or coral-stock. In the common red coral (*Corallium rubrum*) of the Mediterranean, the solid unjointed coral-stock has a thin cortical layer of spicules in which the polyps are retractile.

Coral-like masses, encrusting reefs, are also formed by the animals of the hydroid millepore, which may be distinguished by the multitude of minute cells or openings, much smaller than those of any genuine coral polyp. (See MILLEPORE.)

The simpler, most primitive corals, are cup-shaped, forming a single calicle or corallite, containing but one polyp, as in the early Palæozoic cup-corals, and the existing species of Flabellum, *Caryophyllia*, and *Deltocyathus*, which live buried in the mud in deep cold water in all seas, from Greenland to the tropics.

Microscopic Structure of Coral.— There are two kinds. In the aporose or poreless corals such as Flabellum, Astræa, and the like, the coral-stock is throughout its mass solid and stony. In the perforate kinds, such as Madrepora, all parts of the corallium including the connecting cœnenchym, or common calcareous stock or stem, has a structure like a meshwork, consisting of delicate rods of carbonate of lime so united as to leave interstices, which in the living coral are traversed by a network of interlacing tubes, representing the cœnosarc.

Rate of Growth of Corals.— Little is known regarding the rapidity of growth in corals. A specimen of *Mæandrina labyrinthica*, measuring a foot in diameter and four inches thick in the most convex part, was taken from a block of concrete at Fort Jefferson, Tortugas, which had been in the water only 20 years. Hunt calculated that the average growth of a Mæandrina observed by him at Key West was half an inch a year. Verrill states that a Madrepora found growing on the wreck of the ship Severn grew to a height of 16 feet in 64 years, or at the rate of three inches a year. See POLYPS; RED CORAL.

Coral Islands.— The reef-building corals are the *Madrepora* and *Mæandrina*, the latter dome-shaped and massive. They are confined to waters in which through the coldest winter months the temperature does not fall below 68° F., though usually the water is warmer than this, the mean annual temperature of the north Pacific being about 73.5° F., and of the south Pacific 70° F. Coral reefs are abundant in the West Indies and occur on the coast of Brazil

as far south as Cape Frio, but still more so on the central Pacific. None occur on the western coasts of Europe and Africa and the two Americas. In depth reef-building species do not occur below 15 to 20 fathoms. Coral reefs are divided into fringing, barrier, and circular reefs, or atolls; the latter are rarely regular in shape, but vary greatly in outline. Contrary to the views of Darwin and Dana, it has been found by A. Agassiz that modern coral reefs form as a rule but a thin crust, those of Florida not more than from 50 to 75 feet in thickness; yet Tertiary reefs and those geologically older may be much thicker. According to Darwin and Dana atolls were supposed to have been formed on submarine banks over a subsiding sea-bottom, but owing to the observation of Semper, Agassiz, and others, it is now evident that they may be deposited under any conditions, whether the sea-bottom be stationary, rising, or subsiding. We will, however, have to hold on to the Darwin subsidence theory to account for coral reefs over about 100 feet in thickness. From his prolonged explorations in the West Indies and the Pacific Ocean, A. Agassiz concludes that the barrier reefs of Fiji, the Hawaiian Islands, and the West Indies usually flank volcanic islands and are underlaid by volcanic rocks. Those of New Caledonia, Australia, Florida, Honduras, and the Bahamas are underlaid by outliers of the adjoining land-masses, which crop out as islands and islets in the outer edge of the barrier reefs. Some of the barrier reefs of the Society, Fiji, and of the Carolines, show that the wide and deep lagoons, separating them from the main islands, have been formed by erosion, from a broad, fringing reef-flat.

The reef-flats and outer reefs flanking elevated islands are partly barrier and partly fringing reefs. We may, says Agassiz, trace the passage of elevated plateaus like Guam, Tonga, and some of the Fiji islands, which are partly volcanic and partly limestone, to atolls where only a small islet or a larger island of either limestone or volcanic rock is left to indicate its origin. Atolls also may be formed upon the denuded rim of a volcanic crater, as in certain of the Fijis (Totoya and Trombia), and as in some of the volcanoes east of Tonga.

As to the origin of atolls by subsidence, we really have few data to support the Darwinian theory. Agassiz claims that throughout the Pacific, Indian Ocean, and West Indies "the most positive evidence exists of a moderate, recent elevation of the coral reefs." This is shown by the ridges, pinnacles, and undermined masses of modern or Tertiary limestones left to attest it. The existence of honeycombed pinnacles of limestone within the lagoons of atolls, as shoals, islands, or islets, shows the extent of the solvent action of the sea upon land areas having formerly a greater extension than at the present day. The Maldivian plateau with its thousands of small atolls, rings, or lagoon reefs, rising from a depth varying from 20 to 30 fathoms is overwhelming testimony, says Agassiz, that atolls may rise from a plateau of suitable depth, wherever and however it may have been formed, and whatever may be its geological structure. Indeed he says that many of the atolls in the Pacific are merely shallow sinks, formed by high sandbanks, thrown up around a central area.

The great coral-reef regions are within the limits of the trades and monsoons and areas of elevation, with the exception of the Ellice and Marshall islands and some equatorial islands. In the regions examined by Agassiz the modern reef-rock is of very moderate thickness, being within the limit of depth at which reef-builders begin to grow and within which the land rims of atolls or of barrier reefs are affected by mechanical causes.

Why no coral reefs exist on the western coasts of the two Americas, and their absence at other points, is explained by Agassiz as due to the steepness of their shores and to the absence or to the crumbling nature of their submarine foundations or platforms. Coral reefs also cannot grow off the steep cliff-surfaces of elevated, coraliferous limestone islands.

The proof of the supposed great thickness of coral reefs, to account for which Darwin invoked subsidence, will be ascertained by boring. Thus far the evidence tends to show that the coral beds are not continuous. At Honolulu they contained several beds of volcanic ash, etc. In the Fiji Islands, shell limestones were interstratified with coral rock. The great areas of subsidences postulated by Darwin and by Dana, have been shown to be areas of elevation. The deepest depressions or "deeps" in the Pacific, judging by the Challenger maps, are in regions where there are no coral reefs or atolls. In the present stage of our knowledge, the subsidence theory to account for atolls is only needed where the coral reef-rock is over about 100 feet in thickness.

The literature of the subject is extensive. The classic works are J. D. Dana's magnificent folio in the series of reports of the Wilkes Exploring Expedition, and his more popular volume, 'Corals and Coral Islands' (revised edition, New York 1890); and Darwin's 'Structure and Distribution of Coral Islands' (London, 3d edition, with notes by Bonney, New York 1890). Murray's papers of corals and reef-structures in the 'Proceedings' of the Royal Society of Edinburgh, Vols. X. (1880) and XVII. (1891) are highly important. The Agassizs, father and son, directed much attention to this subject, and Alexander Agassiz in particular has added greatly to information in his 'Visit to the Great Barrier Reef of Australia' (Cambridge, Mass., 1898). The illustrated works of Saville Kent on the Australian reefs should also be remembered, as well as Heilprin's on those of Bermuda. For structure and classification consult Bourne's account of the Anthozoa in Lankester's 'Treatise on Zoology' (London 1900); and for fossil corals consult Zittell-Eastman, 'Text-book of Palæontology' (New York 1900), and the great 'Monographie des Polypiers fossiles des terrains Palæozoiques' of Milne-Edwards and Haime, issued in Paris in 1851.

A. S. Packard,
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Coral Fishes, a name given to several fishes of different genera belonging to the *Chætodontidæ*. They are found in all tropical seas, especially about coral reefs, and are all brilliantly colored. The most important is the *Holacanthus imperator*, the "emperor of Japan," which measures about 15 inches in length and is the most esteemed of all the Indo-Pacific fishes.

Coral Islands. See Coral.

Coral Sea, part of the Pacific Ocean northeast of Australia and between it and the New Hebrides. The numerous coral islands fringing the northeast of Australia and other islands washed by this sea give it its name. In 1874 the Challenger, when making soundings in these waters, found the Coral Sea, in some places, to be 14,700 feet deep.

Coral Snake, a small venomous colubroid snake of the same family (*Elapidæ*) as the cobra. The typical genus (*Elaps*) is a strictly American one. The usual color is rich red with black and yellow transverse bands, making these among the most brilliantly colored of snakes. Owing to the position of the poison-fangs and the small size of the mouth they are, although venomous, usually unable to injure man. One species, the harlequin or bead snake (*E. fulvius*), occurs in the southern United States as far north at least as Virginia. It is a beautiful snake, about two feet or more long, and is less feared than it should be. Most of the remaining species, including the typical *E. corallinus*, are confined to tropical South America and the West Indies.

Coral Tree, a leguminous plant of the genus *Erythrina*, which has about 25 species. They are shrubs or trees with trifoliate leaves and spikes of scarlet flowers. The long pods enclose bright red seeds. They are mostly tropical, natives of America, Africa, and India. One species (*E. herbacea*) is common throughout the southeastern United States, and two more are found in Florida. The plants are much cultivated in greenhouses. An Indian species (*E. indica*) is said to have been stolen by Krishna, the Hindu deity, from the gardens of paradise. This is a spiny species, and is planted for hedges. This species, and (*E. caffra*) (the kaffir-boom of Africa) furnishes soft light wood valuable for industrial purposes.

Coralline, kŏr'a-lĭn, a term popularly applied to sea-weeds with rigid calcareous fronds and also to certain of the zoophytes. The coralline algæ are purple and gradually grow paler and whiter as the season advances. Their habitat is commonly pebbly rocks, to which they cling fast. *Corallina officinalis,* has been employed as a vermifuge.

Coralline, or **Pæonine,** an orange-red color prepared by the action of ammonia, at about 300° F., upon rosolic acid, or upon the washed residue of the action of a mixture of sulphuric, oxalic, and carbolic acids. It differs from magenta in both its tint and its permanency, not being affected by light or by alkalies; but, on the other hand, fabrics dyed with it are readily turned yellow by acids. It is insoluble in water, but dissolves in alcohol with a very rich color. This solution, mixed with soda and a large quantity of water, and tartaric acid added, is employed for dyeing silk. It is also printed upon cotton by means of albumen. The use of this dye has been much restricted on account of its alleged poisonous properties. Certain toxicologists had observed that stockings colored with coralline produced a vesicular eruption which gradually became purulent, and which was attended with febrile and other symptoms. When the dye was dissolved out and administered to small animals it proved fatal to them. Other chemists, however, failed to get this action with coralline, so that it is likely that in some cases deleterious substances are mixed with coralline, or that coralline may differ if prepared in different ways, or that different substances pass under the name.

Co'ram, Thomas, English philanthropist: b. Lyme Regis, Dorsetshire, about 1668; d. London 29 March 1751. He was bred a seaman, and rose to be a merchant captain. In 1694 he settled in Taunton, Mass., and engaged in benevolent work of various kinds. A few years after he returned to sea, and settled in London, after suffering shipwreck off Cuxhaven in 1719. In London he interested himself in the settlement of Georgia, and in planting English artisans in Nova Scotia; but soon began his long agitation for the foundation of a foundling hospital in London, which was at length opened in 1740. Coram's portrait was painted by Hogarth, a warm patron of his scheme. More thoughtful for others than for himself, Coram fell into poverty, from which he was relieved in 1745 by an annuity contributed by his friends.

Coranach, kŏr'a-năk, or **Coronach,** a dirge or lamentation for the dead formerly customary among the Celts of Scotland and Ireland. The coranach is commonly known in Ireland as the caóine (Br. keen) a song of mourning for the dead. This funeral song, or dirge, was usually sung by professionals who had power to improvise and who told of the pedigree, worth, deeds, and death of the deceased. In Scotland the weird, mournful notes of the bagpipes added sadness. The custom of having the caóine or coranach at wakes and funerals has fallen into disuse in both Ireland and Scotland. Frequent mention of the custom may be found in the writings of Sir Walter Scott, Lover, Davis, and other writers. Consult: Crofton Crocker, 'Researches in the South of Ireland.'

Corandagos (kō-răn-dä'gōs) **Islands,** Philippines, a group of islands lying off the northeastern coast of Palawan. The group consists of two islands, Corandagas and Dalangamen, and three islets. The inhabitants, of Malayan race, are mostly engaged in fishing and in the search for edible birds' nests. Pop. about 300.

Corato, kō-rä'tō, Italy, a city in Apulia, about 50 miles southeast of Foggia. The modern city is of little importance, the chief industries being cattle raising and the manufacture of leather and tartar. Near the city are the ruins of the famous Castel del Monte, built by Frederick II., which is one of the most beautiful of the architectural remains of the Middle Ages in Italy. The general plan is a vast octagon, with eight hexagonal towers. The windows are pointed and round arched, and the vaulted halls are supported by triple shafts of marble. It is the chief attraction of the city. Pop. 42,000.

Corban, kŏr'băn, a Hebrew word occurring in the Greek of the New Testament (Mark vii. 11), where it is translated a "gift." It designates an oblation to God, and has reference to a Talmudic formula, by which, under pretence of dedicating anything, as his property, to God, a person might prohibit the use of it from the party to whom it was thus made corban. It is used also by the Jews to signify a thing given to the Deity.

Corbaux, Marie Françoise Catherine Doetter, commonly known as FANNY CORBAUX, Eng-

lish artist and biblical scholar: b. 1812; d. Brighton, England, 1 Feb 1883. When she was about 15 her father suddenly became poor, and without having received any but the most superficial instructions in drawing, she determined to support herself and him by painting. In the same year she received two silver medals for water-color drawings, and within the next three years another silver medal and the gold medal of the Society of Arts. She had been all the time her own instructor. After that she painted small pictures in oil and water colors, but confined herself chiefly to portraits. She designed illustrations for Moore's 'Pearls of the East,' etc., and wrote: 'Letters on the Physical Geography of the Exodus,' the introduction to Heath's 'Exodus Papyri,' and various articles for the 'Journal of Sacred Literature.'

Corbeil, kôr-bā-yĕ, France, a town in the department of Seine-et-Oise, at the junction of the Essenne with the Seine, 25 miles southeast of Paris. It has various manufactures, chiefly of paper, clocks, cotton and linen; and there are large grain-mills and a copper-foundry in the town. Pop. about 10,000.

Corbel, kôr'bĕl, in architecture, a piece of stone, wood, or iron projecting from the vertical face of a wall, to support some superincumbent object. Corbels are of a great variety of forms, and are ornamented in many ways. They are of frequent occurrence in pointed architecture, forming the supports of the beams of floors and of roofs, the machicolations of a fortress, the labels of doors and windows, etc. A cornice supported by a series of corbels is styled a corbel table.

Corbet, Richard, English bishop and poet: b. Elwell, Surrey, 1582; d. Norwich, England, 28 July 1635. He became bishop of Oxford in 1624 and of Norwich 1632. He was a warm friend of Ben Jonson. He wrote: 'Journey into France' (1613); 'Poetica Stromata' (1648). His best-known verses are his 'Farewell to the Fairies.'

Corbett, Henry Winslow, American banker and politician; b. Westborough, Mass., 18 Feb. 1827; d. Portland, Ore., 1 April 1903. He entered mercantile life in Cambridge, N. Y., and was similarly engaged in New York 1840–50. Removing to Oregon in 1851 he was a merchant in Portland till 1867 and subsequently a banker of prominence. He was active in founding the Republican party in Oregon and was a delegate to the convention which in 1860 nominated Lincoln for the presidency. He was a United States senator 1867–73 and a candidate for the same position in 1897. He contributed frequently to benevolent objects and bequeathed nearly $200,000 to educational and charitable institutions in Portland.

Corbett, Julian Stafford, English lawyer and author: b. Surrey 12 Nov. 1854. He was educated at Marlborough and Cambridge and was called to the bar in the Middle Temple in 1877. He practised his profession until 1882 and has since given his attention to literary pursuits. Beside the romances 'The Fall of Asgard'; 'For God and Gold'; 'Kophetua XIII.'; he has published 'A Business in Great Waters'; lives of Monk and Drake in 'English Men of Action' series: 'Drake and the Tudor Navy'; 'The Successors of Drake.'

Corbie (kôr'bĭ) **Steps, or Crow Steps,** steps into which the sides of gables from the eaves to the apex are broken. They form a common feature in Scottish architecture, into which they were probably introduced from France. They are also to be seen in many old houses in Holland, Flanders, etc.

Corbière, Edouard, ā-doo-ār' kôr-bē-ā, French poet and novelist: b. Brest 1793; d. Morlaix 20 Oct. 1875. He published 'The Banian' (1835); 'The Slave'; and other sea tales.

Cor'bin, Caroline Fairfield, American writer: b. Pomfret, Conn., 9 Nov. 1835; married C. K. Corbin, of Chicago, 1861. She has published: 'Our Bible Class and the Good that Came of It' (1860); 'Rebecca, or Woman's Secret' (1866); 'His Marriage Vow' (1874); 'Belle and the Boys' (1879); 'Letters from a Chimney Corner' (1886); 'A Woman's Philosophy of Love' (1892).

Corbin, Henry Clark, American soldier: b. Clermont County, Ohio, 15 Sept. 1842. He was educated in the common school, studied law, and entered the Union army as second lieutenant in the 83d Ohio Volunteer Infantry, 28 July 1862; but before the organization was completed he was assigned to the 79th Ohio Volunteer Infantry (serving therein as second and first lieutenant, respectively, until 14 Nov. 1863, when he was appointed major of the 14th U. S. Colored Infantry. In the following year (4 March 1864) he was promoted to lieutenant-colonel, and 23 Sept. 1865, made colonel of the 14th U. S. Colored Infantry. He was honorably discharged from the volunteer service 26 March 1866, with the brevet of brigadier-general, which honorary rank was bestowed upon him in recognition of meritorious services. In 1866, upon the muster-out of the volunteer army, and upon the recommendation of his military commanders, he was commissioned (11 May 1866) second lieutenant in the regular army. He was appointed to a captaincy of the line 31 Dec. 1866, and from that year to 1876 he was continually in command of his company on the Western frontier in campaigns against hostile Indians.

He was appointed to the adjutant-general's department 16 June 1880, and served therein nine years in the grade of major, seven years in the grade of lieutenant-colonel, and two years in the grade of colonel; and was, when appointed brigadier-general and adjutant-general of the army (25 Feb. 1898), the senior in the corps; having served on the staffs of Gens Hunt, Schofield, Terry, Crook, Miles (with whom he participated in the Sioux Indian campaign), McCook, Ruger, Merritt, and in 1891 conducted a successful campaign against the Moqui Indians in Arizona Territory.

During the Spanish-American war Gen. Corbin was brought into close relations with President McKinley and was by him consulted upon all questions of policy relating to military affairs; and in addition to his duties as adjutant-general of the army he superintended the organization of 250,000 soldiers, and within six months the muster-out of 100,000. Subsequently 35,000 additional volunteer forces were mustered, equipped, and made effective for the Philippine service, and they in turn disbanded — the regular army having been increased during this period to three-fold its former strength. In recognition



HENRY CLARK CORBIN,

MAJOR-GENERAL, U. S. A.

of his services and of the part which he took in the war, the Congress of the United States conferred upon him the rank of major-general in the army of the United States.

Corbin, John, American writer, son of Caroline F. Corbin (q.v.): b. Chicago, Ill., 2 May 1870. He was educated at Harvard, and Balliol College, Oxford, and has since filled various editorial positions in New York. Since 1902 he has been dramatic critic for the New York *Times*. He has published: 'The Elizabethan Hamlet' (1895); 'Schoolboy Life in England' (1895); 'An American at Oxford' (1902); 'A New Portrait of Shakespeare' (1902).

Corbould, kôr'bōld, **Edward Henry,** English historical artist: b. London 5 Dec. 1815. He is a member of the Institute of Painters in Water Colors and was teacher of drawing and painting to the children of Queen Victoria, 1851–72. Among important paintings by him are: 'Marriage of Nigel Bruce and Agnes of Buchan' (1870); 'Queen Victoria' (1871); 'Canterbury Pilgrims' (1874); 'Iris' (1878).

Corchorus, kôr'kō-rŭs, a genus of the linden family (*Tiliaceæ*). There are about 35 species, mostly herbs or small shrubs, natives of Europe and Asia, and diffused in warm and tropical regions. The leaves of *C. olitorious* are used in Egypt and adjacent countries as a pot herb. From the fact that the Jews thus employ them they are sometimes called Jews' mallow. More important, however, is *C. capsularis*, which has long been cultivated for its fibre in China for Chinese hemp, also in India and other eastern countries for making fish lines and nets, gunny bags, rice bags, and "tat," a coarse kind of linen. This and the former species have much more recently been used to furnish jute (q.v.). The negroes in the West Indies use *C. siliquosus* to make coarse brooms, and an infusion of its leaves as a substitute for tea. The Japanese shrub, erroneously called *C. japonicus* by gardeners, is a common garden plant on account of its pretty double yellow flowers.

Cor'coran, Michael, American soldier: b. Carrowkeel, Sligo, Ireland, 21 Sept. 1827; d. 22 Dec. 1863. He received a good education, and came to the United States in 1849. He entered the 69th Regiment, New York, as a private and rose through its grades to the colonelcy. He was court-martialed for refusing to parade his troops in honor of the Prince of Wales in 1860; but before the case was decided the Civil War broke out. He commanded his regiment at Bull Run, was wounded, captured, exchanged in 1862, and organized the Corcoran Legion in 1863, with which he held the enemy in check at Norfolk. He was commissioned a brigadier-general and transferred to the Army of the Potomac. He was killed by the fall of his horse near Fairfax Court House.

Corcoran, William Wilson, American banker and philanthropist: b. Georgetown, D. C., 27 Dec. 1798; d. Washington, D. C., 24 Feb. 1888. He was educated at Georgetown College and established himself in the banking business in Washington in 1837. He became very wealthy and was widely known for his charities and gifts to the public. In 1847 he gave the Oak Grove Cemetery property to Georgetown, founded the Louise Home for Indigent Women in Washington in 1870, and gave to the city of Washington the famous art collection known as the Corcoran Art Gallery. This he endowed munificently and it is now housed in a marble building designed by Ernest Flagg and erected 1894–7.

Corcoran Art Gallery. See CORCORAN, WILLIAM WILSON.

Corcyra, kôr-sī'ra. See CORFU.

Cord-grass, or **Marsh-grass** (*Spartina*), a genus of perennial grasses containing several species, widely dispersed in America, Europe, and Africa. They are often maritime; with creeping rootstocks, simple stems, and long tough leaves. The spikelets carry one flower, which has unequal glumes. Fresh-water cord-grass (*S. cynosuroides*) is found along river banks, lake shores, and brackish coast marshes over the northern part of the United States. It is grown for binding sand and river banks, and when cut early makes fair but coarse hay. It has been used successfully for making twine and paper. It is also used for thatch, and is in bloom from July to October. Fox-grass (*S. patens*) is rather slender and somewhat wiry, and is abundant on salt marshes; with black grass (*Juncus gerardi*) it furnishes most of the salt hay these meadows produce. It blooms from June to September. It is used for packing glassware, etc. Creek-sedge, thatch, or salt marsh-grass (*S. stricta*) grows along ditches and creeks of the Atlantic and Pacific coasts. It flowers from July to October, and is used for making ropes. When young it is eaten by stock.

Cordage. The word "cordage" is used in a comprehensive sense to include all sizes and varieties of the article from binder twine to a cable 15 inches in circumference, though strictly speaking the term is hardly applicable to a rope that is less than half an inch in diameter.

The materials employed for rope making are various, embracing hemp, flax, manila, sisal, jute, and other vegetable fibres. Sisal from Yucatan and East Indian jute are largely used for the manufacture of cheaper grades of rope and for binder twine. Russian and American hemp are preferred for standing rigging, owing to their ability to absorb a great amount of tar. Manila hemp is more extensively used in the manufacture of cordage than any other material, as its great pliancy and strength adapt it to a multitude of uses. Manila hemp is obtained from a species of wild plantain belonging to the banana family and is a native of the Philippine Islands. Its stem has a height of from 15 to 20 feet, is of a dark-green color and very smooth on the surface. The fibre is round, silky-looking, white, lustrous, easily separated, stiff, very tenacious, and very light. Although not in itself very large, the fibre is composed of very fine and much elongated bast-cells. The length of the cells is about a quarter of an inch, and they are not, as commonly supposed, held together by an intercellular tissue or mucilaginous substance. The characteristic roughness possessed by manila fibre is due entirely to mechanical causes, such as, for instance, the laceration of a cell in the separation from the leaf-stalk, or the subsequent opening out of the ends of the cells. While the fibres are weak transversely, they have great strength in the direction of their length. The

tensile strength of manila fibres will average over 30,000 pounds per square inch of section. The plantain is cut near the roots when from two to four years old, and the leaves cut off just below their expansion. The outer leaf is then stripped off, and the fibrous coats are left for a day or two in the shade to dry, and then divided lengthwise into strips three inches wide. They are then scraped by an instrument made of bamboo until only the fibres remain. Bundles of fibres are shaken into separate threads, after which they are washed, dried, and separated according to quality and shipped in bales. From 150 to 200 trees are required to produce 140 pounds of fibre.

Sisal hemp is the product of the agave, a large genus of fleshy-leaved plants found chiefly in Mexico and Yucatan. The fibre is yellowish-white, straight, smooth, and clean, and is about 25 per cent weaker than manila fibre. Much of the sisal hemp is prepared for export to the United States by machinery. Its consumption is fully as large as that of manila, and it is chiefly used for binder twines.

The preliminary treatment of the fibre after it arrives at the cordage mill is approximately the same whether it be manila or sisal, so that a description of the process on one fibre will practically answer for the other. In one of the largest plants in the United States, taken as an example, there are a number of buildings devoted to the manufacture of various classes of cordage, and the ropewalk is two blocks in length. The binder twine-mill is separate and is not run at all times of the year, as the work ceases in the spring, when the orders for twine have been filled; the rest of the plant runs throughout the year. The bales of manila hemp, averaging about 270 pounds each, are opened in the basement of the manila twine-mill, and after the material has been lightly shaken apart it is placed in layers which are sprinkled lightly with oil to soften and lubricate the fibres previous to their passage through the machinery. The first mechanical operation consists in passing the hemp over roughing cylinders bristling with sharp steel prongs or teeth, which straighten out the fibres and remove the tow and fine broken particles, dirt, or other foreign substances. It then passes to the breakers, which are large frames about 25 feet long, consisting of two endless chains studded with steel pins. The first chain runs slowly and feeds the fibres to the second, which runs much faster, the effect being to comb or straighten out the fibres and draw them into a "sliver" or ribbon. The hemp is then hoisted on elevators to the top of the building. Following this operation comes the passage of the hemp through the spreaders and drawing-frames. These machines are similar to the breakers, but are smaller and furnished with steel pins and teeth of gradually increasing fineness, which still further comb and straighten out the fibres, a number of slivers being put together behind each machine and drawn down to one sliver again at the end of each machine. This drawing is repeated a number of times with machines of various degrees of fineness, in order to make the sliver even, without which it would be impossible to spin fine, even yarn. The process is completed in a very fine drawing-frame called a "finisher," and from this the material finally emerges in complete readiness for spinning, having been drawn into slivers, or small, soft ribbons, in readiness for the spinning frames.

The small sliver is fed from one of the cans of the spinning jenny over the endless belt provided with needles, as in the breakers, spreaders, and finishers. These needles carrying the fibre move toward a conductor or "nipper," carrying the sliver with it. The sliver is by this time exceedingly small, and is capable of passing through a small hole in the face-plate of the nipper, where it is compacted in passing through the orifice. A jaw is controlled by a spring which can be regulated so as to adjust the size of the feed. As it leaves this part of the machine the twisting begins. The speed is 1,500 revolutions per minute. The yarn is twisted in a direction called right-handed, and feeds through a pulley by passing through the head block and moving face-plate, and is finally warped around grooved pulleys in order to give the necessary strain to pull the compacted fibres through the nipper. It is then wound on a bobbin to the amount of about 1,000 yards. A special mechanism traverses the bobbin in order that the yarn may be evenly wound. The attendants see that the sliver is regularly supplied and that any accidental breakages in the thread are repaired. The yarn is placed in small cars and sent to the various rope-making departments. If a rope is to be tarred, the yarns are run through copper tanks filled with heated tar. The yarns enter through holes in an iron plate and are drawn through the tank by machinery. As the yarns emerge, the superfluous tar is removed by means of pressing-rollers, and the yarn is wound on bobbins. If the yarn is to be used for binder twine, the sisal hemp is spun finer than manila, and after being spun the yarn, which is now on bobbins, is carried to the twine balling and packing room, where balling machines wind the yarn into balls of proper size.

Rope making is accomplished in various ways and is all done by machinery. The yarn is twisted into strands by means of machines called "formers," and the strands are twisted into rope by means of machines called "layers." If the rope is to be of moderate size, not exceeding an inch in diameter, the formers and layers are combined in one machine. The large machines are very impressive on account of their great size and the rapidity with which the finished product is turned out. In the Farmer machine there are many bobbins, which are arranged in three frames, each of which revolves independently around its own axis, and they are all carried around while in motion by a large frame which supports all three smaller frames. The threads from the various bobbins are passed through apertures in an iron plate, and the motion of each small frame serves to twist the yarn drawn from the bobbins into a strand. The three strands pass upward through a "top" at the upper portion of the machine. As the strands come together they are twisted to form a rope by the movement of the entire machine carrying the three sets of bobbins, which are each rotating separately. The result is a finished rope. The new rope is rotated around several pulleys in order that the proper pull may be obtained to draw the rope tightly through the "top," and it is then wound on one of the reels. This rope can, of course, be used for any purpose and can be made of large size. For well-drilling and other purposes where rope of great

strength but little flexibility is required, cables are used. Cables vary from 1,400 feet in length up, and usually measure from 1⅞ to 2½ inches in diameter. They are composed of three manila ropes instead of strands, and the ropes are twisted together with a very hard "lay," so that they will not untwist when used for drilling, and so that they will resist wear in the continuous rubbing against the side of the casing and the walls of the well. Owing to their length and construction, cables are always made on machines and not in a ropewalk. On one of the machines in the factory under consideration it is possible to make cables 15 inches in circumference. The reel containing the rope that has just been made is now placed on a cable-making machine. The principle of cable making is the same as rope making, only that actual ropes are used instead of strands. Each reel is turned around on a horizontal plane by means of gears, while it is paying out its rope. The entire machine carrying the three reels is turned simultaneously on a horizontal plane, the ropes are rove around various pulleys, and finally, as they pass through a "top" at the upper part of the machine, they are twisted together to form the cable, and then, after being rove around grooved sheaves to obtain the necessary pull, are reeled up by a power reel. When a sufficient length of cable is obtained, it is ready for shipment. In this plant there is a large horizontal rope and drilling cable-laying machine, but the principle does not differ materially from the vertical machine.

Ropes of considerable size, towing lines, and ships' cables of the largest dimensions are made on the ropewalk, which is 1,100 feet long and passes under one cross street. The yarn is rewound on larger bobbins, and the number used depends on the size of the rope. These bobbins are put on a framework of wood located near one end of the ropewalk, and the ends of the yarn are passed through holes in an iron gauge-plate, known as the face-plate. It then passes through cast-iron tubes, and the yarn is fastened on hooks of the forming machine, which consists of a truck which travels on a track the entire length of the walk. There are as many hooks as there are strands. As the former moves away from the face-plate it draws the yarn with it, and at the same time each hook revolves by means of gears, twisting the yarn left-handed into a strand. The machine is actuated by a cable which lies along the floor of the ropewalk. The cable passes over a large wheel at the left and serves to operate the mechanism which turns the hooks, and at the same time winds up a cable attached to the end of a ropewalk, thus making its motion positive. When the forming machine has reached the upper end of the ropewalk, the strands, each 1,100 feet in length, are completed. They are now taken and laid over on the other side of the walk, and the strands are then ready to be "laid" or made into rope. Two laying-machines are required, one at each end of the walk, and are known as the "upper" and "lower" machines. They also give the rope what is known as a fore turn and an aft turn. As many of these strands as are required for the rope are stretched to full length and are attached to hooks on the laying-machine. The upper machine has several hooks, but only one is used. All the strands are fastened to this hook, and they turn left-handed in laying, and the lower machine has as many hooks as there are likely to be strands, and operates in the opposite direction. The strands are meantime placed in the grooves of a conical wooden block called a "top," through which is passed an iron bar which is fastened to an upright post of a car called a "top sled." Pieces of rope called "tails" are fastened on the bar and wound around the rope to be laid. They help regulate the lay and assist in giving the rope a finish-gloss. The top having been mitred between the strands as closely as possible to the top, the sled is gradually forced along as the twisting proceeds in a right-handed direction. The lower machine keeps all the strands from untwisting. The top sled finally arrives at the lower end of the walk, with the full length of the completed rope behind it. It is then compactly coiled by a reeling machine, covered with burlap, and shipped to its destination.

Cordage Industry. Although rope-making constituted one of the most important branches of business from the earliest days of the American colonies, like almost all the local manufacturies, it was many years before it began to develop sufficient strength to entitle it to be regarded as an industry. The first rope-walk was constructed at Boston, by John Harrison, in 1642, just 12 years after the town had been founded, and, prior to this time, all such products that had been required in the making of rigging and tackle was either brought direct from England by the captains of the various vessels, or was imported into this country for sale. In fact, it was not until the Boston shipbuilders had commenced the construction of the 160-ton "Trial," that the several advantages to be derived from a local rope-walk were fully appreciated, and it was at their instigation that Harrison, a Salisbury rope-maker, was invited to come to Boston, where he set up his "rope-field," 10 feet 10 inches wide, on the land adjoining his house on Purchase Street, at the foot of Summer Street. At this time such work was done out of doors. Posts large enough to permit of the making of the largest sizes of rope then in use were firmly fixed in the ground in open fields, and upon these the cords were suspended and the ropes made.

Harrison's coming to Boston had been largely due to the fact that he was assured that he should have a monopoly of the business for a term of 21 years, and when, at the end of that time, the town officials gave permission to a John Heyman to "set up posts," the fact that the latter was restrained in business to the "libertie onely to make fishing lines," did not prevent the older rope-maker from protesting against what he considered the invasion of his rights. Accordingly Heyman's license was revoked, and Harrison had everything his own way up to the day of his death.

With the "original" rope-maker dead, however, the business began to extend its influence into other parts of the town. Rope-walks multiplied in number most rapidly in the West and North Ends, until there were finally no less than 14 of them. In 1793, an additional impetus was given to the business by the action of the general court in granting a bounty for American-made rope. On 30 July 1794, the date of the great fire, seven rope-walks were destroyed,

and the selectmen, who had been flooded with protests from citizens who objected to this business being carried on in the heart of the town, refused to grant further licenses except upon the low lands west of the Common. As the result, six large rope walks were immediately constructed at that point. They ranged from 20 to 24 feet in width and were each about 900 feet in length. Destroyed by fire in 1806, five of them were rebuilt, only to be burned again in 1819. During the first year of the mayoralty of the elder Quincy, the walks were removed still further out of town for the purpose of improving the neighborhood around the Common, but by the latter part of the 18th century the industry had assumed such proportions that it was generally admitted that "the men employed in this work outnumbered any other class of mechanics in Boston." At this time the work in the rope-walks was performed by hand, the method having been described by Longfellow in his poem, 'The Ropewalk.' The twisting of the fibres was accomplished by a man who walked backward down the "walk," spinning from the hemp which was strung round his waist. The twist was imparted to the rope by a wheel, which was at first turned by a boy, although this purpose was afterward attained by the use of horse, or even water power.

It was not to Boston alone that the early industry of rope-making was confined, however. Nantucket, in the old days of her prosperity, had three large rope-walks, all of which long ago disappeared; there was one at Castine, Me., one at Portland, Me., and several in other parts of the country, including one on Broadway, New York.

The Portland, Me., "walk," one of the few of the ancient establishments with a modern history, was first constructed by Samuel Pearson. Later his two sons, Samuel and George C. Pearson, who had learned their trade at Portland, started the Suffolk Cordage Company, which, under the name of the Pearson Cordage Company, now has one of the largest mills in the country. Another son, Charles H. Pearson, at first became connected with the Boston Cordage Company, and, still later, with the Standard Cordage Company.

The large business which is now conducted on the Pacific coast was instituted by A. L. Tubbs, of California, sometime in the fifties. Recognizing the opportunities for the construction of such an industry in the far West, Mr. Tubbs purchased the machinery of one of the old Boston plants, and shipped it to California, where two or three large factories now stand as monuments to his enterprise.

Prior to about 1850, nearly all the spun yarns used in the making of cordage were imported by the American manufacturers. As such yarns were the product of Russian serf labor, they could be brought to this country and sold for less money than similar yarns could be produced in America, so it was not until the introduction of improved machinery reduced the cost of local manufacture that the importation of this raw material ceased.

The modern factory system began to take the place of the more crude and primitive methods of making rope soon after 1830, and from that time until 1850, the conflict between the two modes of manufacture was waged with considerable bitterness. By the new system it was possible to spin a rope several thousand feet long upon an upright apparatus that occupied but a few square feet, the necessary twist being imparted by a rapidly rotating machine which was not unlike that which is used in cotton and woolen mills. At the same time, while its cost was cheaper, the factory-made product was not an entire success. There were purposes for which the rope made by the rope-walk method was far superior, and the makers of the old-fashioned article used the words "patent cordage" to disparage the factory-made product. As time passed, however, the invention of improved machinery tended to put an end to such rivalry. The most important inventions are those of John Good, of New York. It was his spreaders and breakers that did away with the use of lappers, and his nipper and regulator on spinning-machines that gave such universal satisfaction until the perfection of the "preparation machinery" evolved methods that superseded his process.

It was the invention of the self-binding harvester that played an important part in furthering the interests of the industry, and, about 1878, the mills of the country began to increase their size and output to a noticeable degree. Among the most prominent factories started prior to or during that period, one may mention the establishments of Sewall, Day & Company, of Boston; the Pearson Cordage Company, of Boston; J. Nickerson & Company, of Boston; Weaver, Fitler & Company, of Philadelphia, afterward, as at the present time, Edwin H. Fitler & Company; the Plymouth Cordage Company, of Plymouth, Mass.; the Hingham Cordage Company, of Hingham, Mass.; the New Bedford Cordage Company, of New Bedford, Mass.; Baumgardner, Woodward & Company, of Philadelphia; J. T. Donnell & Company, of Bath, Me.; William Wall & Sons, of New York; Lawrence Waterbury & Company, of New York; Tucker, Carter & Company, of New York; the Elizabethport Steam Cordage Company, of New York; Thomas Jackson & Sons, of Easton, Pa.; J. Rinek's Sons, of Easton, Pa.; and John Bonte's Sons, of Cincinnati.

As may be seen from the above list, the cordage industry, even in those comparatively recent times, was largely confined to towns either on the coast or in close proximity to the seaports, for those were the days when the great demand for cordage was for export purposes, or for the direct use of ships temporarily located at the American ports. Later, such factors as the decline in American shipping; the substitution of wire for hemp standing rigging, and the increased demand for binder twine, so altered the conditions of the industry that the location of factories became a matter of secondary importance. Thus, they began to multiply in the interior, especially in the middle West, such cities as Akron, Peoria, Xenia, and Miamisburg, becoming a new centre for the industry.

In 1843, the total quantity of manila hemp that was manufactured in the United States amounted to only 27,820 bales, or 7,511,400 pounds. To realize the ridiculously small proportions of such a product, it is only necessary to remember that any one of several of the large mills in this country could now manufacture the same quantity of hemp in less than

50 days, by running day and night, or that a similar quantity of hemp could now be brought direct from Manila in about the same length of time, by the use of two steamers. So rapidly did the industry expand, however, that, by 1863, it had increased in size no less than five times, while the period of the Civil War created such a demand for cordage that the factories in the North were utterly unable to comply with it. The profits of one eastern factory alone, during that period, amounted to more than $500,000 a year, and this was no exceptional case, for everywhere manufacturers were fairly inundated with orders that they simply could not fill. It was about 1860 that the first sisal hemp was imported into the United States. Purely an experiment in the beginning, less than 200 tons having been used during the first year, the product was so favorably received by the trade that it soon became one of the great factors in the cordage industry, a fact which fully acounts for the rapid increase in importations from the paltry 200 tons to the amount of our present imports, a quantity that is greatly in excess of 80,000 tons.

During all this time, however, no action had ever been taken to regulate the price of cordage. Business had extended until the American product was now accounted a factor in almost every part of the world. To meet these ever-widening demands, factories had increased, both in number and in the importance of their output, but no effort had been made to fix the price of the product. As the result certain abuses had come to prevail among the firms engaged in the business, and it was to meet this situation and better, if possible, the condition of affairs, that the first meeting of the cordage manufacturers was held early in 1861. The result of this meeting was an agreement, which was perfected and signed, on 23 February. Thereafter weekly meetings were held by the manufacturers, at which trade conditions were not only discussed, but any complaints were considered, and regulations were effected respecting the standard of prices. From time to time the agreement of 1861 was amended, and, in July, 1874, a complete revision was adopted, the manufacturers pledging themselves, "as men of honor and integrity," to faithfully observe all its provisions. In April, 1875, a still stronger agreement was made, but as complaints about underselling were still made, and as, in the absence of any specified penalty, it was necessary to accept any reasonable excuses, the manufacturers finally decided to adopt what has since been known as the "pool system." According to this system, which went into operation 1 Jan. 1878, the business of the country was divided among the various manufacturers in what was deemed just proportions. When the business of either of these concerns in any one month exceeded the proportion which had been assigned to it, it was compelled to pay a certain amount per pound on the excess to the treasurer of the "pool," while the concern that fell behind the specified production received a gratuity to a corresponding extent. The novelty of the plan acted in its favor for a time, and, although it did not entirely put a stop to the custom of cutting prices, it worked so well that the scheme was continued from year to year. The percentages ranged from 11¼ to 1 per cent.

In January, 1880, the amount of the pool was reduced, by stages, from 2 to ¼ of a cent per pound, and, in January, 1881, it was abolished altogether. By 1882, conditions had become so unsatisfactory that it was found necessary to re-establish it and, on 28 June, new proportions were agreed upon. These remained in force for a period of three years, when the new concerns that had been formed were taken into the "pool," and, after much labor, a new adjustment of proportions was accepted in July, 1885, remaining in existence until April, 1887, when it was broken up.

The history of the National Cordage Company, the next attempt to associate the various cordage manufacturers, dates from 1 Aug. 1887, when four of the leading New York concerns formed themselves into a "trust." Their aim was to control the prices of manila and sisal hemp, but the effort was a failure. In January, 1890, an attempt was made to compel other manufacturers to join their organization. As none of those who complied with these demands knew the terms which had been made with his neighbor, a condition of distrust was engendered which finally, 4 May 1893, drove the corporation into the hands of a receiver, in spite of the fact that it had paid 8 per cent. dividends on its preferred stock since 1891, and from 9 to 10½ per cent. on its common, the last dividend being declared on both only three days before the failure.

As the result of the reorganization the United States Cordage Company was formed, but as this corporation was also unsuccessful in its schemes to monopolize the purchase of raw material, the factories which had been purchased by the National Cordage Company went back into the market. Some of them were repurchased by their former owners or their representatives, while some few have yet to find purchasers. There were at least two important reasons to account for the deterioration in the value of these manufacturing properties. One was the unsettled condition of affairs in the Philippine Islands, under which manila hemp advanced so materially as to prohibit its use for binder twine, and to lessen the demand for it in the making of cordage. The natural increase in the demand for sisal also had the effect of increasing its price.

Another factor in the cordage trade was represented by the binder twine situation. In the beginning, when there was considerable doubt

Years	Manilla		New Zealand	Sisal		
	Bales	Pounds	Pounds	Bales	Pounds	Total Pounds
1895	404,000	109,323,000	2,000,000	400,028	144,010,080	255,333,080
1896	404,006	109,081,620	2,000,000	359,110	129,270,600	240,361,220
1897	359,000	96,930,000		474,891	170,852,760	267,782,760
1898	487,573	131,644,710		389,125	136,193,750	277,838,460
1899	436,611	117,884,970		490,699	176,651,640	294,536,610
1900	283,000	76,410,000		470,000	169,20 ,000	245,610,000

as to the success of this twine, the cordage houses made it for the manufacturers of harvesting machinery at a profit of several cents a pound. When the market position of this product was established, the harvest-machine makers began to manufacture their own twine, and while this was done at a third of its original cost, the loss of these contracts was a serious setback to the cordage industry.

The preceding table shows the annual consumption of hemp from 1895 to 1900 inclusive.

Cordaitales (from the genus *Cordaites*, named in honor of A. J. Corda), an extinct great group of naked-seeded and therefore gymnospermous plants, resembling in certain respects the cycads, gingko, and the conifers. The *Cordaitales* are the most ancient of well-known seed-plants, and were quite generally distributed over the globe from middle Devonian into Permian time. Their leaves, as in portions of the *Cordaites* shale of New Brunswick, Canada, often occur packed in layers like those of modern forests. The group seems to have culminated in the Upper Carboniferous, where it formed one of the dominant types of the coal-swamp forests. Large and finely silicified trunks are not uncommon in various Palæozoic horizons of the northern central United States and in Canada. Some of the sections of trunks from the Black Shale (Upper Devonian of Indiana) are two or more feet in diameter by 20 feet long, and indicate stately forest trees from 100 to 150 feet high. The most noteworthy cordaitalean specimens are the silicified leaves, stems, and fruits with microscopic structure preserved from the "black flints" of the Coal Measures of Grand Croix, France. The study of this material, together with various trunks, casts, and imprints, has revealed nearly all the critically important structures of these long-extinct plants.

The *Cordaitales* were mostly tall and rather slender trees with smooth columnar shafts branching freely near their summits into a dense crown of lesser branches bearing simple large leaves in great abundance (Figs. 1 and 2). The leaves are usually long, and vary from linear to broadly elliptical forms. They are from 10 or more centimetres to a metre long, and from very narrow to 20 centimetres broad. The general habit of these trees was thus quite different from that of any in the existing flora. The species with shorter leaves may, however, be compared in a general way with such conifers as *Dammara* (the kauri pine of New Zealand), or with some forms of *Podocarpus*.



Fig. 2.—*Cordaites lingulatus*. Group of attached leaves. After Grand 'Eury.

On the basis of leaf forms Grand 'Eury divides the group into the genera *Cordaites*, *Dory-*, and *Poa-Cordaites*. The first of these divisions includes mainly very large spatulate and blunt-ended leaves, the second large lanceolate and sharply pointed leaf types, and the third grass-like forms. The genus *Cordaites*, as first used, may include any of these. The isolated stems are usually described as *Cordaioxylon*, branches as *Cordaicladus*, and the pith as *Sternbergia* or *Artisia*. Isolated fruits are named *Cordaianthus*, and the seeds *Cordaicarpus*.

Anatomically the stem is much like that of the conifers, the wood of some forms being scarcely distinguishable from that of *Araucaria*, the Norfolk Island pine. The wood is wholly centrifugal, and its elements are radially arranged and without distinction between primary and secondary xylem in transverse section. Growth-rings are either not present or obscure, a fact that may in part indicate little difference in the rate of seasonal growth. The tracheary tissue consists of groups of spiral elements next the pith, followed by a broad zone of wider spiral and scalariform tracheides, and then by the bulk of the wood as composed of pitted tracheides. The medullary rays are narrow. The very large pith, sometimes four inches in diameter, is, however, far more suggestive of that of cycads. As growth proceeded, the pith underwent transverse constriction at intervals, leaving a succession of diaphragm-like spaces, the casts of which resemble piles of biconvex lenses, or coins, long only known separately as *Artisia* or *Sternbergia*. Transverse rupture and discoidal structure of the pith is paralleled in the walnut and some other living plants.



Fig. 6.—*Samaropsis Pitcairniæ*. Fragment of an ovulate inflorescence from Westphalia with the seeds in groups and borne on elongated stems. Natural size. After Carruthers.

The roots are of diarch, triarch, or tetrarch structure. Outside is a broad zone of periderm apparently derived from the external cortex.

The leaves have conspicuous parallel veins repeatedly dichotomizing in all but the narrowest almost grass-like forms, and are anatomically very similar to single pinnules of either cycads or the *Bennettiteæ*. As in the latter, the structure is well known from silicified specimens. The bundles are of the mesarch type. Each is surrounded by a strong sheath connecting with a usually heavily developed hypodermal sclerenchyma.

The knowledge of the floral morphology of the *Cordaitales* now constitutes one of the most interesting chapters of paleobotany. It is largely based on the labors of Grand 'Eury and Renault, the latter having been so fortunate as to find silicified strobili of both sexes of certain species



For explanation, see Article Cordaitales.

preserved in astonishing perfection in the siliceous fragments of Grand Croix.

The staminate strobili are borne in considerable number in inflorescences, as shown in Fig. 7. Each strobilus is about a centimetre long and consists of a thick axis covered by long spirally arranged bracts resembling leaves, and replaced near the apex of the fruit by interspersed fertile filaments bearing erect tufts of five or more sporangia (see Fig. 3, A and B). The pollen grains, which have been found both in place and actually in the pollen chambers of the macrospores, are large and contain a highly interesting group of prothallial cells (Fig. 3, C), suggestive of a theoretical transition stage between *Pteridophytes* and *Spermatophytes*.



Fig. 5.— *Cordaianthus spicatus* Lesquereux. Diagrammatic, showing involucrate nutlets distichously to subalternately borne on both sides of a thick rigid stem. Involucral scales embracing the nutlets indistinct. From the coal measures of Pittston, Pa. One half natural size.

The ovules occur either singly (Figs. 5 and 7), or in small groups (Fig. 5), or in strobili quite similar to, and, as fossil imprints, often difficult to separate from, the staminate form just described. In ovulate strobili of the latter type (Fig. 4, A and B), the lateral bracts are long and overlapping, and a terminal tuft of long bracts crowns the strobilus. Here each ovule is borne in the axil of one of the larger bracts on the end of a very short lateral axis, which itself bore some bracteoles. The ovule had two integuments, an outer thick and fleshy, and an inner forming a delicate lining to the outer, from which it may not have been wholly distinct.

In another species, *Cordaianthus grand 'curyi* (Fig. 4, C. and D), the outer integument is partly broken away, and but little is preserved of the inner, the nucellus being left standing free. In its upper end the pollen chamber is plainly to be seen, as well as several pollen grains, the structures corresponding quite precisely to the similar stage at the beginning of fertilization in the living gingko and the cycads. This fossil ovule was "surprised at the very moment of pollination." It is of fundamental importance that pollen grains found in the nucellar canal are larger than those in the sporangia, and their group of internal cells more developed, while grains found free in the matrix exhibit an intermediate condition. The conclusion is hence doubtless correct that the pollen grains continued to grow after their discharge from the anther, and especially after their entrance into the pollen chamber. It is obvious that such a condition is one of the most readily thinkable steps in the later stages of the evolution of heterospory and of seed-plants from asexual spore-bearing plants producing dicœcious and free growing prothallia. By analogy from the cycads and gingko there can be but little question that the pollen grains produced free-swimming spermatozoids.

The *Cordaitales* were, at least in part, monœcious (Fig. 7), but must also have exhibited various conditions of monœcism and dicœcism.

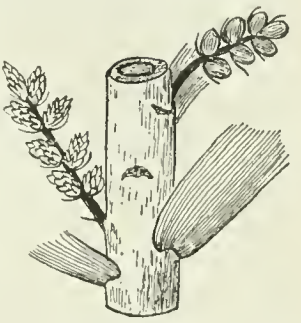


Fig. 7.— *Cordaianthus Pitcairniæ*. Branch of monœcious form bearing leaves and leaf scars with an ovuliferous inflorescence on the right, and on the left an inflorscence consisting of small staminate strobili. After Grand 'Eury.

Seeds in various stages of growth have been found attached to the leafy twigs of cordaitean forms, sometimes solitary (Fig. 5), and sometimes in groups (Fig. 6). The mature seeds are in *Cordaicarpus* heart-shaped at the base and somewhat flattened. The testa is double. The outer layer, or sarcotesta, was soft and fleshy during life, the endotesta hard and lignified. No embryos have yet been found in any species, although in certain younger and wonderfully preserved specimens *archegonia* have been observed. Structurally the seeds are distinctly cycad-like.

The *Cordaitales* derive a unique significance from their great age and primitive characters, so manifestly important in our conception of the manner and course of plant evolution. Most paleobotanists are agreed that the cordaitalean and cycadalean groups had a common ancestry and that from the *Cordaitales* have been derived the *Gingkoales*, the *Coniferales*, and probably the *Gnetales*. Others would go further and place the *Cordaitales* in a position ancestral to the angiosperms as well. This is more debatable. Increasing knowledge of the group will, however, doubtless show it to be a much more varied one than as yet conceived of, and in any case its discovery must be regarded as one of the great triumphs of paleobotany.

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Corday d'Armans, kôr-dā där-mäṅ, **Marie Anne Charlotte,** French revolutionist: b. Saint Saturnin, near Séez, Normandy, 27 July 1768; d. Paris 17 July 1793. Her lover was accused by Marat as a conspirator against the republic, and assassinated by villains hired for that purpose. This excited Charlotte Corday to revenge. History had inspired her with a deep-rooted hatred against all oppressors, and she determined to free her country from Marat. Having left home, she entered Paris 11 July 1793, and obtained an interview with Marat on the pretext of disclosing Girondists' plots. The assemblies at Calvados were the first subjects of conversation, and Marat heard with eagerness the names of those who were present at them. "All these," he exclaimed, "shall be guillotined."

At these words Charlotte plunged her dagger into his bosom, and he called out "*A moi! mon ami*"; when some attendants rushed in and seized her. On the morning of 17 July she appeared before the revolutionary tribunal with a dignified air, and her replies were firm and noble. She spoke of her deed as a duty which she owed her country. Being condemned to death she was guillotined the same day, retaining her presence of mind to the last. Her remarkable beauty, and her lofty bearing on her way to the guillotine, sent a thrill even through the hearts of her executioners. One young German enthusiast, Adam Lux, a deputy from the city of Mentz, on witnessing the execution, conceived a romantic passion for her, and when her head fell, he cried with a voice hoarse with emotion: "She is greater than Brutus." He wrote a pamphlet, suggesting that a statue with such an inscription should be erected to her memory. He was arrested and guillotined. André Chénier, who had paid a glowing poetical homage to her heroism, shared the same fate before a year had elapsed. When Vergniaud was informed of Charlotte's death, he exclaimed: "She has killed us, but she teaches us how to die." Consult Lamartine, 'Histoire des Girondins'; Huard, 'Mémoires sur Charlotte Corday' (1866).

Corde'lia, the youngest daughter of Lear in Shakespeare's tragedy, 'King Lear.'

Cordeliers, kôr-dā-lē-ā. 1. Another name for the Franciscan friars in general, but given, in France to the branch of the order usually known as Franciscan Friars Minor (O. F. M.). After the death of Saint Francis in 1226, the next minister-general of the order relaxed somewhat the rigor of the rule of poverty as taught and practised by Saint Francis. This relaxation caused a division in the order, a number of the friars adopting the modified rule were called Conventuals (O. M. C.), and those adhering to the original observances were called Observantines, and later, Friars Minor. In France the name Cordeliers was given to them on account of their girdle. The Cordeliers or Friars Minor are in several places in the United States. (See FRANCISCANS.) 2. A political club during the first French revolution, which received the name of Cordeliers from the fact that its members met in the chapel of the old convent of the Franciscan friars situated near the Rue de l'École de Médicine and the Rue de l'Observance, in the centre of the quarter of Paris known as the Cordeliers' district. The club of the Cordeliers became the focus of the wildest agitators, while at the same time it was constantly quarreling with the Jacobin club. The leading events of the reign of terror may be traced to the conflict of the two clubs, and chiefly to the influence of the Cordeliers, of whom Marat and Danton were the ruling spirits. At the time the club was in its zenith, Camille Desmoulins edited a popular journal in connection with it, under the name of 'Le vieux Cordelier,' without however identifying himself completely with the politics of the formidable club. After the execution of Danton, Hébert, and Chaumette, the club declined in influence, and was closed by the law of 6th Fructidor, or 23 Aug. 1795, which dissolved all the political clubs of France.

Corder, Frederick, English musician: b. London 26 Jan. 1852. He studied at Cologne under Ferdinand Hiller and after his return to England devoted himself to his profession of composer and teacher. Among his works are the operettas of 'Philomel' (1880), and 'The Storm in a Teacup' (1880); the operas of 'Morte d'Arthur' (1877); and 'Nordisa' (1887); the cantatas 'The Cyclops' (1881), and 'The Bridal of Triernain' (1886); and 'In the Black Forest,' an orchestral suite (1876).

Cordiani, kôr-dē-ä'nē. See SANGALLO.

Cordier, Henri, ōn-rē kôr-dē-a, French Orientalist: b. New Orleans 8 Aug. 1849. He studied in Paris and England, and in 1869 went to China, where he remained till 1876. After his return to France he became professor of the history, geography, and law of the Orient at the School of Oriental Languages at Paris and was also professor at the School of Political Science. He published a bibliography of China, 'France in China in the 18th Century' (1880); 'Conflict between France and China' (1884); and 'Atlas Sino-corée' (1896).

Cor'dierite, a name formerly given to the mineral iolite, in honor of Cordier, a French geologist.

Cordilleras, kōr-dēl-yā'räs, a name from the Spanish for a mountain chain or ridge, formerly applied to any lofty and straight areas of land, but now specifically to chains, ranges, or ridges of mountains, and especially to such of these elevations as are long and continuous. It is used particularly in physical geography, although in geology also it is sometimes applied to mountain systems at or near the coasts or borders of continents. The name was first given by the Spaniards to the chains of the Andes (q.v.) in South America, and was afterward extended to their northern continuation through Central America and Mexico, and finally to the entire mountain systems stretching up the western coast of the United States, British Columbia, and Alaska, and spreading eastward to include the Rocky Mountains (q.v.). This portion of the continent geographers have come to call the Cordilleran region of North America, designating the corresponding elevations of South America under the old name of Andes. This region covers in the United States the whole western mountain portion of the country, including the Sierra Nevada, the Coast Range, the Cascade Range (qq.v.), and extending to and embracing the Rocky Mountains, as well as all the ranges lying between them and the mountains of the western coast. Included within this Cordilleran region are mountain systems many of whose lesser chains, in length and elevation, equal some of the famous ranges of Europe. As these great physical features of our own country become better known in their general magnificence and their interesting local details, their relative importance in comparison with similar forms of the earth's surface is more highly estimated.

Cor'dite, a smokeless powder employed by the English government. It was invented in 1889 by Sir Frederick Abel and Prof. James Dewar, and consists of a mixture of nitro-glycerine 58 parts, nitrocellulose 37, vaseline 5. The nitrocellulose is a mixture of various cellulose nitrates, insoluble and soluble. At the Royal Gunpowder Works at Waltham Abbey it is required that the nitrocellulose used shall not con-

tain more than 12 per cent of soluble cellulose nitrate, or 0.6 per cent of mineral impurities, nor less than 12.5 per cent of nitrogen. It is made by intimately mixing the ingredients in a mechanical kneading-machine with the aid of acetone, by which the whole is converted into a gelatinous mass which is then squirted into cords by means of a "stuff press," a machine similar to those used in forming macaroni. The cords vary in diameter from 0.01 inch to 0.65 inch. The former are chopped into short lengths for use in pistols, the latter for use in 12-inch guns. The cords for small-arm cartridges are 0.0375 inches in diameter. The cords are heated in drying-houses to drive off the acetone, leaving them in the form of an amber-colored, translucent, flexible mass.

Cordite is made up into charges by reeling the cords on bobbins, and then spinning these strands into larger cords, thus obtaining the desired length, volume, and weight. Before the South African war 1,200 tons of cordite had been manufactured for the British government. It is believed that the performance of cordite in that war was not satisfactory, and that the authorities are prepared to adopt a straight nitrocellulose powder.

Córdoba, kōr'dō-bä, Argentine Republic, a province next in size and population to that of Buenos Ayres, bounded on the north by Santiago del Estero, on the east by Santa Fé, on the south by Buenos Ayres and the territorial government of La Pampa, and on the west by the provinces of San Luis, La Rioja, and Catamarca. Area 54,000 square miles. Its northwestern portion is mountainous, and rich in minerals. Copper, silver, gold, lime, marble, graphite, and salt are found. The central and eastern regions lie in a great plain, watered by the rivers Cuarto, Segundo, Primero, Dulce, etc., with the lake called Mar Chiquita; and here agricultural and grazing industries are carried on. Cattle, horses, and mules are bred in the south; wheat and fruits are raised along the river courses; there are large flocks of sheep and goats in the centre and north. Besides wheat and fruits, the principal crops are maize, lucern, barley, sweet potatoes, and white potatoes. Of the total productions, about one half, in value, are pastoral, one third agricultural. The mining industry is as yet comparatively undeveloped. Manufactures are: Flour, lime, and cement, bricks, hides, and leather, beer, wine, and alcohol, boots and shoes, cut wood, vermicelli, gold embroideries, butter and cheese, cut stone, belts, candles, and soap, artificial ice, etc. Principal railway centres are the capital city, Córdoba (q.v.), Villa Maria, and Villa Nueva. Under the constitution of the republic dated 25 Sept. 1860 the province has its own constitution, "framed upon the basis of a republican representative system of government, and in harmony with the principles, declarations, and guaranties of the national constitution"; said provincial constitution relating to "the administration of justice, the administration of the local government, and primary instruction. Upon these conditions the federal government guarantees to each province the practice and enjoyment of its own constitutions." The provinces have their own local institutions and laws; "they elect their governors, legislators, and provincial functionaries of all classes, without the intervention of the federal government." The province is represented in the national legislature by two senators, elected by the provincial legislature, and by deputies elected directly by the people. Each province is, for this purpose considered as an electoral district, and the election is by a plurality of votes in the proportion of one deputy to each 20,000 inhabitants, or fraction of that number not less than 10,000. Population of the province 419,000.

Córdoba, Argentine Republic, the capital of the province of the same name, situated on the right bank of the Rio Primero at the junction of five railways. It is one of the progressive inland cities, having adopted many of the modern improvements, such as electric light, running water, street railways, sewers, and excellent pavements. Its university, founded in 1813; astronomical observatory, established 1871; National Academy of Science; National Meteorological Institute; national college, normal schools and elementary schools, have made it well known as an educational centre. Railway communication with Buenos Ayres was established in 1869. The first national fair was held here in 1871. A score of newspapers and reviews are published in the city. There are fine public buildings and private residences, and attractive parks. Pop. about 65,000.

Córdoba, Mexico, a town 66 miles west of Vera Cruz; in a fruitful valley, 3,045 feet above the sea. Formerly important, it sank greatly after the revolution; but in later years it somewhat recovered its trade. It is surrounded by rich coffee plantations. Pop. about 8,000.

Córdoba, Spain, a town and capital of the province of Cordoba, situated on the Guadalquivir, in Lower Andalusia. It is built on a gentle declivity of a chain of mountains, forms an oblong quadrangle, and is surrounded with walls and lofty towers. A part of the town is of Roman, a part of Moorish origin; many of the buildings are in ruins, and a number of gardens occupy a great part of the inhabited space. The streets are narrow, crooked, and dirty; the plaza mayor, the principal marketplace, however, is distinguished for its size, its regularity, and the beauty of the colonnade by which it is surrounded. The remains of the residence of the Moorish kings now form a part of the archbishop's palace. The cathedral is a splendid building, originally a mosque, erected in the 8th century by King Abd-er-Rahman I. Cordoba has always carried on considerable trade; and even under the Moors the leather exclusively manufactured there (cordovan) was exported in all directions. At what period the Romans laid the foundation of the town (Colonia Patricia, afterward Corduba) is not known. In 572 it was conquered by the Goths. During the reign of the dynasty of the Ommiades it was the capital of Arabian Spain; and afterward it became the residence of the powerful caliphs of the West, the sacred city of the Moors, and the centre of Mohammedan worship and of Arabian splendor and science. At that time the city is said to have been about 15 miles in circuit, and to have possessed a population of 1,000,000. In 1236 it fell an easy prey to Ferdinand III. of Castile. In 1808 it was pillaged by the French, who captured it again under Soult in 1810. Pop. (1897) 57,313. The

province of Córdoba includes the fertile and beautiful valley of the Guadalquivir and the snow-capped mountains of Sierra Morena. The area of the province is 5,188 square miles, and the population (1897) 443,582.

Cordon, kôr-dŏn or kôr'dŏn, in a military sense, troops so disposed as to preserve an uninterrupted line of communication, to protect, for instance, a country from hostile invasion; also a similar line intended to protect a place from contagious diseases. In the latter sense it is called a *cordon sanitaire*. The word "cordon" also means, in fortification, the coping of the escarp or inner wall of the ditch. It is usually rounded in front and projects one foot over the masonry.

In horticulture, cordon is a term applied to a system of training fruit trees. The trees are dwarfed by training and pruning to one or two stems which extend horizontally or obliquely, and from which the fruit-bearing spurs are developed. The objects sought are economy of space and increased size and improved quality of fruit. The system is in little use in America, where land is cheap, but in Europe it is very popular. It is best adapted to such trees as pears and apples, which naturally bear their fruits upon spurs.

Cordon Bleu, kôr-r-dŏn blĕr, a knight of the ancient French Order of the Holy Ghost, at one time the most aristocratic order in the kingdom, whose decoration was attached to a blue ribbon or baldric. The knights frequently met in club form, and were noted for their excellent dinners, whence the term came to be applied to a cook of superior skill.

Cordon Grand, grŏn, a term applied to a member of any grade of the French Legion of Honor, because the cross of the order is always suspended from a broad ribbon.

Cordova, Fernando Fernandez de, fĕr-nän'dō fĕr-nän'dĕth dā kōr'dō-vä, Spanish general and statesman: b. Madrid 1792; d. 1883. He entered the military service in 1810, and was rapidly promoted during the war with Napoleon. In 1847 he officiated for a short time as minister of war, and was appointed inspecting general of the infantry. On 8 March 1850 he was nominated captain-general of New Castile, in the following year to the same position in Cuba, and in 1853 general-in-chief of the cavalry. Immediately after the outbreak of the revolution of 1854, he was called upon by the queen to form a new cabinet. This he declined, but he ordered his soldiers to fire upon the insurgents, and when the latter proved victorious, he fled to France. In 1856 he returned to Spain, and was reinstated in his position of general, and 10 years later was active in the revolution which drove Queen Isabella from the throne. He was captain-general of Cuba for the second time in 1870.

Cordova, Francisco Hernandez de, frän-thēs'kō är-nän'dĕth dā, Spanish navigator: b. in the latter part of the 15th century; d. Cuba 1517. He was the discoverer of Yucatan, which he visited in 1517, and had several encounters with the natives. He lost some of his men, and two were taken prisoners and carried up the country. Shortly after his return to Cuba he died; but the account he gave of his discoveries led to a new expedition under Juan de Grijalva, to whom was subsequently assigned the honor of the discovery.

Cordova, Francisco Hernandez de, Spanish soldier and explorer: b. about 1475; d. Leon, Nicaragua, March 1526. In 1514 he went to Panama with Pedrarias and was sent by him to take possession of Nicaragua. He founded Granada, Leon, and other towns, and discovered the outlet of Lake Nicaragua. He was afterward accused of disloyalty in trying to set up an independent government, and was seized by Pedrarias and beheaded.

Cordova, José Maria, hō-sā' mā-rē'ā, South American general: b. Antioquia, Colombia, about 1797; d. 17 Oct. 1829. At the age of 15 he left his father, who belonged to the Spanish party, and joined a band of guerrillas, among whom he soon became noted for his intrepidity in their contests with the Spaniards. At the battle of Boyaca, 8 Aug. 1819, he won the rank of colonel. Not long after he was appointed general, and distinguished himself at the battle of Ayacucho, after which he was made general of division on the field. In September 1828 he became head of the war department of the republic of Colombia, under Bolivar, but, a year afterward, revolted against him. He found but few adherents, however, and being attacked, 17 October, by a force greatly superior to his own, was slain with most of his followers.

Cordova, Luis Fernandez de, loo-ēs fĕr-nän'dĕth dā, Spanish general: b. Cadiz 1799; d. Lisbon 29 April 1840. He took a prominent part in the movement of 1820 as a constitutionalist, and in that of 7 July 1822 as an absolutist. He officiated afterward on diplomatic missions abroad, and eventually deserting the forlorn cause of Don Carlos, espoused that of Christina and Isabel, took a distinguished part in the battle of Mendigorria, was appointed commander-in-chief of the Christinos as successor of Valdez, but unable to finish the war, was driven from office after the movement of 1836, and fled to France, whence he soon returned to Spain. He now conspired with the party of Narvaez against Espartero, but retired to Portugal when the latter came into power.

Cordova, Pedro de, pā'drō dā, Spanish Dominican missionary: b. 1483; d. Santo Domingo 28 June 1525. He was vicar of the first Dominican colony in Hispaniola in 1510, preached against Indian slavery, and endeavored to have laws framed for the protection of the Indians.

Cordova y Figueroa, ē fē-gā-rō'ä, **Pedro de**, Chilean historian: b. Concepcion 1692; d. there after 1770. He served in the Chilean army in Araucania and was alcalde of his native place about 1740. He wrote a 'Historia de Chile' which includes an account of the settlement of the country up to 1717. The MS. of the work was preserved at Madrid.

Cordova, a name of several cities. See CORDOBA.

Cor'dovan, a fine leather which took its name from the Spanish city of Cordova, where it was manufactured in large quantities. It was also called cordwain.

Corduroy, kôr'dū-roi, a ribbed cotton fabric, woven with a pile which is cut so as to

leave the surface ridged in the direction of the warp. See FUSTIAN; VELVETEEN.

Corduroy Road, a roadway covered with logs, slabs, or poles laid close together. They were used generally in the pioneer days to bridge over swampy places, and at the present day are sometimes found in country districts.

Cordwood, wood, especially firewood, cut in lengths of 4 feet and piled in an oblong stack 8 feet long and 4 feet high, which thus has a cubical content of 128 feet. The term is applied also to piles of similar wood of other dimensions in length and height, but the measurement of such piles, for purposes of sale or of labor on the material, is determined by the same standard of cubic content.

Cordyceps, kôr'dĭ-sĕps, a genus of fungi, some of which are found on dead leaves and branches, while others are remarkable for growing on the larvæ of insects, which they latterly kill. It grows very freely over a wide area, and in different countries 28 species have been found.

Corea, kō-rē'ạ. See KOREA.

Coreal, Francisco, frăn-thēs'kō kō-rā-ăl', the name affixed to the 'Voyage aux Indes Occidentales' which was issued in Paris 1727. Its author asserted that he was born in Carthagena in 1648 and had traveled extensively through Florida, Mexico, and South America. The book abounds in errors and is probably a compilation.

Coregonus, kō-rĕg'ō-nŭs, a genus of abdominal fishes, family *Salmonidæ*. The teeth are very small or wanting, the scales large and the height or front of the first dorsal greater than its breadth. The genus is common in European waters and unusually large varieties are found in the rivers of Siberia. The best-known American representative is *Coregonus albus,* the whitefish.

Corelli, Arcangelo, ärk-ăn'jā-lō kō-rĕl'lē, Italian musician: b. Fusignano 1653; d. 18 Jan. 1713. As a performer on the violin his execution is said to have been peculiarly characteristic, full of spirit and expression, and his tone firm and uniform. Corelli formed and conducted, according to the original plan of Crescentini, the celebrated musical academy which met at the palace of Cardinal Ottoboni every Monday. By his sonatas on the violin, and by his concerts, he may be considered, as it were, the creator of a new species of harmony, especially for his own instrument.

Corelli, Marie, English novelist: b. Italy 1864. In infancy she was adopted by Charles Mackay, the poet. She was educated in London, and on beginning her literary career adopted as a pen name that which subsequently became her legal name. She has published: 'A Romance of Two Worlds' (1886); 'Vendetta' (1886); 'Thelma' (1887); 'Ardath, the Story of a Dead Self' (1889); 'Wormwood'; 'The Soul of Lilith' (1892); 'Barabbas' (1893); 'The Silence of the Maharajah' (1895); 'The Sorrows of Satan' (1895); 'Camcos' (1896); 'The Mighty Atom' (1896); 'The Murder of Delicia' (1896); 'Ziska' (1897); 'Jane' (1897); 'The Master Christian' (1900); 'Boy' (1900); 'Temporal Power' (1902).

Corentyn, kō-rĕn-tĭn', a river of South America, separating British and Dutch Guiana, and flowing into the Atlantic. It has a course of about 400 miles, and is navigable below the Great Cataracts in lat. 4° 20' N.

Coreopsis, kō-rẹ-ŏp'sĭs, a genus of annual and perennial herbs of the natural order *Compositæ,* tickseed. Nearly all the species are natives of eastern North America. They have showy, generally yellow, flowers in heads, and are widely cultivated in gardens. They are of easiest culture, being grown from seeds sown in a hot-bed and transplanted to any ordinary garden soil where they will blossom freely with little attention beyond keeping the ground free from weeds.

Corfe (kôrf) Castle, a castle in Dorsetshire, England, now in ruins, standing a little north of a small town, to which it gives its name, and with which it is connected by a bridge of four arches. It was built by King Edgar, and at its gates his son Edward the Martyr was murdered in 979. It was the occasional residence of King John, and was for some time the prison of Edward II. During the great civil war it was heroically defended against the parliamentarian forces by Lady Bankes. It was subsequently taken by Fairfax through the treachery of an officer of the garrison, when it was demolished, 1646.

Corfield, William Henry, English sanitarian: b. Shrewsbury, Eng., 14 Dec. 1843; d. Marstrand, Sweden, August 1903. He was educated at University College, London, and in the medical schools of Paris and Lyons, and was the first professor of hygiene appointed in London. He has published: 'A Digest of Facts Relating to the Treatment and Utilization of Sewage'; 'Lectures on Water Supply, Sewerage and Sewage Utilization' (1874); 'Laws of Health' (9th ed.); 'Dwelling Houses: Their Sanitary Construction and Arrangements' (4th ed. 1898); 'Disease and Defective House Sanitation' (1896); 'Sanitary Knowledge in 1800'; 'The Etiology of Typhoid Fever and Its Prevention' (1902).

Corfu, kôr-foo' (anciently CORCY'RA), a Greek island in the Mediterranean, the most northerly and the largest of the Ionian Islands, at the mouth of the Adriatic, near the coast of Albania, about 40 miles long, and from 15 to 20 wide; square miles, 431. The surface rises in the north at one point to the height of 3,000 feet, but the southern portion is low. The scenery is beautiful, the climate pleasant and healthy, save for malaria in the centre and in the south, and the soil is fertile. Oranges, citrons, grapes, honey, wax, oil, and salt are abundant. The ancient name of the island was Drepane. A Corinthian colony settled in the island in the 8th century B.C., taking it from the Illyrian inhabitants. Corcyra's quarrel with Corinth was one of the immediate causes of the Peloponnesian war. The Venetians possessed Corfu from 1386 to 1797, making it a Christian bulwark against the Turks. The British held it from 1815 to 1864. Pop. about 65,000. Corfu, the capital, is finely situated on the eastern coast on a promontory which terminates in a huge isolated rock crowned by the citadel; the streets are Italian in style; chief edifices, the cathedral, government palace, and Ionian academy. There is a good harbor and considerable trade. Pop. about 18,000.

Coriander, kō-rī-ăn'der, an annual or biennial herb (*Coriandrum sativum*) of the natural order *Umbelliferæ*. It is a native of southern Europe and is cultivated for its fruit (Coriander-seeds), used for flavoring culinary dishes, liqueurs, and confectionery. The plant attains a height of about three feet, bears very finely divided strong-smelling leaves, and small white flowers in terminal umbels. The odor of the leaves is disagreeable, but that of the fruit, when fully ripe and dry, is pleasantly aromatic. In America the plant is less cultivated than in Europe, and is less favored than caraway; but it has been grown in gardens with other culinary herbs, and has escaped to fields, where it is rarely troublesome as a weed. It succeeds well upon any rich soil, and may be cultivated like parsley, caraway, or other sweet herbs of the same natural order. The fruit contains about 1 per cent of a volatile oil, which is the active principle. It is a mild and agreeable carminative, and is useful in flatulence and chronic dyspepsias.

Corinna, kō-rīn'a, Greek lyric poetess of Tanagra, in Bœotia. She was contemporary with Pindar, whom she is said to have conquered five times at musical contests, and therefore her image, crowned with the chaplet of victory, was placed in the gymnasium of Tanagra. According to Pausanias, who relates this fact, she was so beautiful that her charms may have influenced in some degree the opinion of the judges. Of the numerous poems which the ancients ascribed to her, only a few fragments have come down to us. They have been collected by Bergk in 'Poetae Lyrici Graeci' (4th ed. 1878), and by Schneidewin in 'Delectus Poetarum Græcorum' (1839). Madame de Staël has given the name of Corinne to the heroine of one of her novels.

Corinne, kō-rēn, or Italy, a novel by Madame de Staël, published in 1807. Besides its romantic and sentimental interest, in its treatment of literature and art it has always been considered authoritative. It served indeed for many years as a guide-book for travelers in Italy, though modern discoveries have somewhat impugned its sufficiency. When it first appeared its success was instantaneous.

Cor'inth, a celebrated city upon the isthmus of the same name. It was renowned among the cities of Greece, commanded by its advantageous position a most important transit trade, and possessed all the splendor which wealth and luxury could create; while its citadel, the Acrocorinthus, rendered it one of the strongest fortresses of Greece. Only a few ruins remain to attest its ancient magnificence. Of the three ancient harbors the western harbor, Lechæum, on the Gulf of Corinth, is choked with sand, as is the eastern harbor, Kekhries (ancient Cenchreæ), on the Saronic Gulf. These were anciently the chief harbors of Corinth. The shallow harbor Schœnos, now Kalamaki, at the eastern entrance of the canal across the isthmus, is used to some extent. There is still a wretched village on the site of ancient Corinth. New Corinth (Nea Korinthos) stands about three miles to the northeast on the coast of the gulf, on the railway from Athens to Patras. It is a small town built since 1858, is the capital of the eparchy of Argolis and Corinth, and the seat of an archbishop. It has a harbor and custom-house. Pop. 5,000.

In ancient Corinth great exchange of Asiatic and Italian goods took place. The duty paid on these goods afforded a great revenue to the state; and the citizens accumulated such wealth, that Corinth became one of the most magnificent, but at the same time most voluptuous cities of Greece. Aphrodite was the goddess of the city, and courtesans were her priestesses, to whom recourse was often had, that they might implore the protection of the goddess in times of public danger; and a certain number of new priestesses were consecrated to her at the commencement of important enterprises. Lais and several other females of the same profession were distinguished by their great accomplishments and beauty, and the high price which they set on their charms; hence the old proverb, *Non cuivis homini contingit adire Corinthum*, that is, "It isn't everyone that can afford to go to Corinth." The virtuous women celebrated a feast to Aphrodite apart from the others.

The mythical Sisyphus was the founder of the Æolian dynasty, which is represented as the first that ruled in Corinth. It was conquered by the Heraclidæ, and Corinth was subsequently ruled by an oligarchy called the Bacchiadæ, in whose time the colonies of Syracuse and Corcyra were founded. This was overthrown by Cypselus in 657 B.C. Periander was the next ruler. Corinth took a prominent part in the development of Greek colonization and was long a great naval power. In the sequel Corinth became the head of the Achæan League, and was conquered and destroyed by the Consul Mummius, 146 B.C. Julius Cæsar, about a hundred years later, rebuilt it; but its commerce could not be restored; the productions of the East now took the road to Rome. A Christian community sprang up in the city under Paul's ministrations, and to it he addressed two letters. The Venetians received the place from a Greek emperor; Mohammed II. took it from them in 1458; the Venetians recovered it in 1687, and fortified the Acrocorinthus again; but the Turks, under Ali Comourgi, celebrated in Byron's 'Siege of Corinth,' took it anew in 1715, and retained it until Greece became independent. Against any enemy invading the Morea from the north, Corinth and its citadel were formerly of the highest military importance, and as a fortified post it continued of importance to modern times. But by the present Greek government it has been neglected.

Corinth, Advance on (30 April–30 May 1862), and **Battle of** (3–4 Oct. 1862). Corinth, Miss., an important strategical point, was early occupied by the Confederates. It was the objective point of Gen. Halleck's campaign, for which, early in April 1862, he was concentrating Grant's and Buell's armies at Pittsburg Landing, on the Tennessee River. On 3 April Gen. A. Sidney Johnston marched from Corinth with 40,000 men to strike and crush Grant before Buell could join him; surprised him on the morning of the 6th, at Shiloh; and after a severe fight drove him back to the river, where he was joined by Buell's advance division. Johnston was killed during the battle, and was succeeded by Gen. Beauregard. Grant and Buell renewed the battle on the 7th; Beauregard was defeated, and led his army back to Corinth, hav-

ing lost 10,000 men. Gen. Halleck joined the army at Shiloh, 11 April, assumed command, drew reinforcements from every direction, and at the end of the month had 110,000 men. Grant was second in command. On 30 April the movement began on Corinth, 27 miles distant, held by Beauregard with about 50,000 men, his army having been reinforced. Early in May Halleck began to throw up elaborate works. It was a siege from start to finish, the army entrenching from the Tennessee River to Corinth. On 9 May occurred an engagement in which the Union loss was about 180 killed and wounded; the Confederate loss about 160. Halleck continued his slow approaches, gradually gaining ground, and 28 May he was within a mile of Beauregard's main line. On the morning of the 30th it was discovered that Beauregard had made a clean retreat. At Baldwyn, 31 miles from Corinth, he remained until 7 June, when he fell back to Tupelo, 52 miles from Corinth. Halleck occupied Corinth on 30 May, and Gen. Gordon Granger's cavalry, supported by 50,000 infantry, followed Beauregard as far as Baldwyn and Guntown, and here the campaign for Corinth ended. The loss of Corinth was followed by the fall of Fort Pillow and Memphis and the opening of the Mississippi down to Vicksburg.

On 1 Oct. 1862, Gen. Grant, in command of the Union army operating in west Tennessee and northern Mississippi, had about 48,000 effective men. Gen. Earl Van Dorn, commanding the Confederates in Mississippi, believing that a successful attack on Corinth would expel Grant from west Tennessee, concentrated Lovell's division of his own army, with the two divisions of Gen. Sterling Price's army at Ripley, 30 miles southwest of Corinth, 28 September. Next day he marched north, and arrived at 10 o'clock on the morning of 3 October, three miles northwest of Corinth, where he formed his army for attack. He had about 22,000 men. Rosecrans had been warned, and had made dispositions for the attack. In a severe action that day Van Dorn gained two miles of ground and captured two guns. The main works defending the town were close to it, and consisted of a series of heavily armed redoubts, connected by rifle-pits or breastworks. By 9 o'clock that night Rosecrans had formed his lines for the next morning's battle. It was after 9 o'clock of a still, intensely hot day, before Van Dorn attacked. The battle, which was fought with fury on both sides, did not exceed an hour in duration, and by noon Van Dorn's army, Lovell's division covering the rear, was in full retreat, from one of the most sanguinary fields of the War. Gen. Sterling Price, in his report, says: "The history of this war contains no bloodier page, perhaps, than that which will record this fiercely contested battle." At night Van Dorn halted at Chewalla, six miles from the field, next morning hastening his march for Pocahontas to retire by the way he had come. After fighting at Davis' Bridge over Hatchie River, in which he inflicted upon the Federals a loss of 539 killed and wounded, and himself lost 127 killed and wounded, 420 prisoners, and 4 guns, Van Dorn crossed the Hatchie at Crum's Mill, six miles south, and took the road to Ripley, thence to Holly Springs.

The Union loss at Corinth was 355 killed, 1,841 wounded, and 324 missing; an aggregate of 2,520. Rosecrans says he buried 1,423 Confederates, but the Confederate reports show a loss of 505 killed, 2,150 wounded, and 2,183 missing; an aggregate of 4,838. Deducting the loss at Davis' Bridge (127 killed and wounded, and 420 prisoners), the Confederate loss at Corinth was 2,528 killed and wounded and 1,763 missing. Consult: 'Official Records,' Vols. X. and XVII.; Grant, 'Personal Memoirs'; Sherman, 'Memoirs'; Greene, 'The Mississippi'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.; Roman, 'Military Operations of General Beauregard,' Vol. II.; Force, 'From Fort Henry to Corinth.'

E. A. Carman.

Corinth, Gulf of, a beautiful inlet of the Mediterranean, about 80 miles long, between the Peloponnesus and northern Greece, having the Isthmus of Corinth closing it in on the east. It is better known as the Gulf of Lepanto.

Corinth, Isthmus of, an isthmus connecting the Morea (Peloponnesus) with northern Greece. It varies in width from four to eight miles. A canal, about four miles long, was constructed across the isthmus in 1882–93, which enables vessels to sail from the Archipelago to the Adriatic without rounding Cape Matapan.

Corinthian Order, that order of Grecian architecture of which the most characteristic feature is the capital of the column, which is adorned with beautifully carved acanthus leaves, but varies considerably in minor details. The column is generally fluted, with a fillet between the flutings, and stands upon a base. The entablature is variously decorated, especially the cornice; the frieze may be quite plain, or sculptured with foliage and animals. The Corinthian order was not very common in Greece before the time of Alexander the Great. Among the Romans it was much employed. See Architecture, Plate I.

Corinthians, Epistles to the, two epistles addressed to the Church at Corinth, which have been admitted as genuine writings of St. Paul by even the most critical assailants of the New Testament canon. They were written at a time when the Corinthian Christians had become divided into several parties, some of them inclining to the customs of the Jews. As expositions of doctrine they are second in importance only to the Epistle to the Romans. They are also the most instructive of all the inspired compositions of their class, from the insight which they furnish into the personal character of St. Paul himself, and the conditions of the apostolic Church. The first epistle may be divided into four parts. In the first (chaps. i.–iv.) Paul discourses generally on the dissensions among themselves because of attaching themselves to certain teachers. The second division (chaps. v.–x. 33) is occupied with the concerns of Christians as individuals, and treats of several questions, such as celibacy, which had caused dissension at Corinth. In the third portion of the epistle Paul gives directions for the decent celebration of public worship, with special reference to the abuses which prevailed in the celebration of the Lord's Supper. Lastly, in chapter xv. the doctrine of the resurrection is vindicated, and the epistle concludes (chap. xvi.) with a request that a contribution might be made for the saints at

Jerusalem. The second epistle arranges itself under three divisions. In the first (chaps. I.–VII. 16) the apostle speaks of his sufferings for the gospel's sake, and other matters. The second part (chaps. VIII. IX.) enters at length on the subject of the collection for the poor saints of Jerusalem. In the third (chaps. X.–XIII.) Paul defends himself against his calumniators. The date of these epistles is 57 or 58 A.D.

Consult: Fouard, 'Life of St. Paul'; Conybeare and Howson, 'Life and Epistles of St Paul'; Dean Stanley, 'Commentary on the Epistles.'

Corinthians, Third Epistle of the, an apocryphal epistle or letter, which like one said to have been sent from the Corinthians to St. Paul, were both in Armenian. Apocryphal letters or epistles made their appearance at a very early period after the death of the apostles. See APOCRYPHA.

Corinto, Puerto de, poo-ār'tō dā kō-rēn'tō, Nicaragua, the principal port of entry on the Pacific coast of that republic. A railroad, owned and operated by the government, connects it with Momotombo, at the head of Lake Managua, a distance of 58 miles. There are four regular lines of steamships which touch at Corinto, carrying passengers, mail and general cargo, and navigating the Pacific from North to South America. Owing to the intense heat and unhealthfulness of the place, very few people live there, except the government employees, steamship agents, and those employed on the railway and wharves. A "convention of peace and obligatory arbitration" was signed here 20 Jan. 1902, by plenipotentiaries of the governments of Nicaragua, Costa Rica, Salvador, and Honduras.

Coriolanus, kō"rĭ-ō-lā'nŭs, **Gaius Marcius,** Roman hero, called Coriolanus because the city of Corioli, the capital of the kingdom of the Volsci, was taken almost solely by his exertions. Coriolanus became very unpopular when, during the famine which prevailed in Rome 490 B.C., he proposed to distribute the provisions obtained from Sicily among the plebeians only on condition that they would agree that the tribuneship should be abolished. Banished for this cause, Coriolanus, resolving to revenge himself upon his country, went to the Volsci and prevailed upon them to go to war with Rome before the expiration of the truce. He himself was joined with Attius Tullius in the command of their army, which immediately made itself master of the cities of Latium, and the Volscian camp was pitched in sight of Rome before troops could be raised for the defense of the city. The envoys sent by the senate returned with the answer, that Rome could purchase peace only by the surrender of the territory taken from the Volsci. A company of Roman matrons, headed by Veturia, the mother, and Volumnia, the wife of Coriolanus, at length subdued his resolution and he withdrew his army, but attempting to justify himself in an assembly of the Volsci was assassinated in a tumult excited by Attius. Shakespeare, in his play of 'Coriolanus,' calls the hero's wife Virgilia, his mother Volumnia, and the Volscian leader Tullus Aufidius.

Coriolanus, a tragedy by Shakespeare (written about 1609). It is founded on North's 'Plutarch.'

Cork, First Earl of. See BOYLE, RICHARD.

Cork, Ireland, a maritime county, province of Munster, having Saint George's Channel south, County Limerick north, Kerry west, Waterford and Tipperary east. Extreme length, east to west, 110 miles; extreme breadth, 70 miles. The coast is indented with numerous bays and inlets, of which the more important are the bays of Bantry, Dunmanus, Long Island, and Clonakilty, Kinsale, and Cork harbors; and is serrated with headlands and promontories. Off the coast lie the islands of Clear, Whiddy, Dursey, Bear, and several smaller. The county is watered by the Bandon, Lee, and Blackwater, and numerous smaller streams. Pop. (1891) 438,432; (1901) 404,813.

Cork, Ireland, city in the south of Ireland, capital of the county of Cork, situated on the river Lee. It is 15 miles from the sea, and besides an upper harbor at the city itself, and quays extending over four miles in length, there is a lower harbor at Queenstown, 11 miles below. The entrance, deep and narrow, is strongly fortified on each side. Cork is the third city in Ireland, and exports great quantities of grain, butter, bacon, eggs, and live stock. The principal industries are tanning, distilling, brewing, and the making of tweeds and friezes. There are also iron foundries and yards for the building of iron ships. The principal buildings are the Protestant and Roman Catholic cathedrals, exchange, custom-house, chamber of commerce, court-house, Queen's College, etc. There is a naval dockyard at Haulbowline, an island within Cork harbor. Pop. municipal borough, 80,124; parliamentary borough, 104,496.

Cork, the external bark of a species of oak (*Quercus suber*) which grows in Spain, Portugal, France, Italy, Tunis, Algeria, and Morocco, and is distinguished by the cellular texture of its bark, and the leaves being evergreen, oblong, somewhat oval, downy underneath, and waved. The area over which the culture extends is about as follows: Portugal, 600,000 hectares; Spain, 300,000 ha.; Italy, 80,000 ha.; France and her African possessions, 661,000 ha., of which 420,000 are in Algiers and 82,000 in Tunis. The cork oak grows in forests in the company mostly of firs and evergreen oaks, but in a part of Tunis there are forests consisting entirely of cork oaks. The bark of these Tunisian forests is said to be of an extraordinarily excellent kind. France, Great Britain, Germany, and the United States receive about 85 per cent of the total production of cork. Germany, Russia, and the United States have no prohibitory duties on importation of cork and cork goods, and admit the material free or with only a trifling impost. Great Britain also permits of the free entry of cork and draws most of its supplies from France, Spain, and Portugal. The last named takes the chief place in cork productions, producing nearly one half of the total growth of the bark — about 450,000 quartels out of the million produced. The greater part of this — perhaps three fourths — is the crude bark, while the remainder is in manufactured stoppers. Spain exports only manufactured wares. In the collecting of cork it is customary to slit it with a knife at certain distances, in a perpendicular direction from the top of the tree-trunk to the

bottom; and to make two incisions across, one near the top and the other near the bottom of the trunk. For the purpose of stripping off the bark, a curved knife with a handle at each end is used. Sometimes it is stripped in pieces the whole length, and sometimes in shorter pieces, cross cuts being made at certain intervals. In some instances, after the perpendicular and transverse incisions are made, the cork is left upon the trees until, by the growth of the new bark beneath, it becomes sufficiently loose to be removed by the hand. After the pieces are detached, they are soaked in water, and when nearly dry are placed over a fire of coals, which blackens their external surface. By the latter operation they are rendered smooth, and all the smaller blemishes are thereby concealed; the larger holes and cracks are filled up by the introduction of soot and dirt. They are next loaded with weights to make them even, and subsequently are dried and stacked, or packed in bales for exportation. In the course of eight or nine years the same tree will yield another supply of cork.

The uses of cork were well known to the ancients, and were nearly the same as those to which it is applied by us. Its elasticity renders it peculiarly serviceable for the stopping of vessels of different kinds, and thus preventing either the liquids therein contained from running out, or the external air from passing in. The use of cork for stopping glass bottles is generally considered to have been introduced about the 15th century.

The practice of employing this substance for jackets to assist in swimming is very ancient; and it has been applied in various ways toward the preservation of life when endangered by shipwreck. The cork jacket used to preserve the lives of persons in danger of drowning may be constructed as follows: Pieces of cork about three inches long by two inches wide, and the usual thickness of the bark, are enclosed between two pieces of strong cloth or canvas, and formed like a jacket without sleeves; the pieces of cloth are sewed together round each piece of cork, to keep them in their proper situations; the lower part of the jacket about the hips is made wide enough to give freedom to the thighs in swimming; and the whole is made sufficiently large to fit a stout man, and is secured to the body by two or three strong straps sewed far back on each side, and tied before; the straps being thus placed to enable any wearer to tighten it to his own convenience.

The floats of nets used for fishing are frequently made of cork. Pieces fastened together make buoys, which afford direction for vessels in harbors, rivers, and other places. In some parts of Spain it is customary to line the walls of houses with cork, which renders them warm and prevents the admission of moisture. On account of its lightness cork is used in making artificial legs; and from its being impervious to water it is sometimes placed between the soles of shoes to keep out moisture.

In the cutting of corks (when they are made by hand, and not, as is now generally the case, by machinery), the only tool employed is a very broad, thin, and sharp knife; and as the cork tends very much to blunt this, it is sharpened on a board by one whet or stroke on each side after every cut, and now and then upon a common whetstone. The corks for bottles are cut lengthwise of the bark, and consequently the pores lie across. Bungs and corks of large size are cut in a contrary direction: the pores in these are therefore downward — a circumstance which renders them much more defective in excluding air than the others. The parings of cork are used for making Spanish black, and largely in the manufacture of linoleum and similar goods.

Corleone, kōr-lā-ō′nā, Sicily, a town in the province of Palermo, and 22 miles south of the city of Palermo, near the source of the Belici. It is well built, has several churches and convents, a prison, royal college, and some other public edifices. The inhabitants are principally engaged in agriculture. Pop. about 15,000.

Corleone, a novel by Francis Marion Crawford, published in 1897. It is the fourth in the 'Saracinesca' series of modern Italian stories. The scene is mainly in Sicily. The leading character is Don Orsino, son of Giovanni Saracinesca and hero of 'Sant' Ilario.' The novel takes its title from the fact that Vittoria, the Sicilian heroine, is of the Corleone race.

Cor'liss, George Henry, American inventor: b. Easton, N. Y., 2 June 1817; d. Providence, R. I., 21 Feb. 1888. The construction of stationary steam-engines was revolutionized by his improvements and a single engine made by him moved all the machinery in the Centennial Exposition of 1876.

Corliss Engine. See Steam Engine.

Corm, or **Cormus,** in botany, the dilated base of the stems of some plants, as the crocus, cyclamen, etc. It is commonly called bulb or root tuber, but is actually neither.

Cormon, Fernand, fār-näṅ kôr-môṅ, French painter: b. Paris 22 Dec. 1845. He studied under Cabanel, Fromentin and others, and in 1875 he received the Prix de Salon; in 1887 a medal of honor at the Salon of that year; in 1889 the Grand prize at the Paris Exposition, and became an officer in the Legion of Honor. His best-known works are: 'The Stone Age' (1884); 'The Victors of Salamis' (1887); other works of his are 'Cain' (1880), and 'The Raising of the Daughter of Jairus.' His portraits have given him a high reputation in that branch of art.

Cormoran, a giant in the nursery tale 'Jack, the Giant-killer.'

Cor'morant (a corruption of the French words *corbeau marin*), the trivial name of a genus of aquatic birds included by Linné under *Pelecanus*, but properly removed thence by Brisson, to form a distinct genus, denominated *Phalacrocorax*. The cormorants constitute a family *Phalacrocoracidæ* of the order *Steganopodes*. They have the hallux united to the other toes by a common membrane, extending to the base of the broad nails, a condition described as totipalmate, and their feet are thus most admirably adapted for swimming; yet they are among the very few web-footed birds capable of perching on the branches of trees, which they do with great ease and security. The feet are short, robust, and rather turned outward; the legs are wholly feathered, and closely drawn toward the belly; the tarsus is naked, one third shorter than the outer toe, much compressed, and carinated before and behind. The wings are moderate and slender, with stiff quills, of which the second or third primaries are long-

est; the tail is rounded, and composed of 12 to 14 rigid feathers. In the adult the external nostrils have become obliterated, an admirable adaptation to their diving habits, and a bony style is attached to the occiput. The male and female resemble each other in size and plumage, which is remarkable for the iridescent and bronzy reflections of the black feathers; but the young, especially when about a year old, differ greatly from the adult birds.

About 25 species of cormorant are at present known, and are distributed over the whole world. As illustrating their habits those of the common cormorant (*P. carbo*) are described. Like the pelicans, to which they are closely allied in conformation and habits, the cormorants reside in numerous communities near the waters, chiefly salt, whence they obtain fish. It is scarcely possible to imagine any animal better adapted to this mode of life, since they dive with great force, and swim under water with such celerity that few fish can escape them. While engaged in this chase they not only exert their broadly webbed feet, but ply their wings like oars to propel their bodies forward, which, being thin and keel-shaped, offer the least degree of resistance to the water. They swim at all times low in the water, with little more than their head above the surface, and, therefore, though large birds, might easily be overlooked by one unaccustomed to their habits. Should a cormorant seize a fish in any other way than by the head he rises to the surface, and tossing the fish into the air, adroitly catches it head foremost as it falls, so that the fins, being properly laid at the fish's sides, cause no injury to the throat of the bird. When standing on shore the cormorant appears to very little advantage, both on account of the proportions of its head, neck, and body, and because of its awkward manner of keeping itself erect, being under the necessity of resting upon its rigid tail feathers, in which attitude they have been likened to rows of black bottles stood out to dry. But, mounted in air, these birds are of swift and vigorous flight, and when desirous of rest alight on the branches of tall trees or the summits of rocks, where they delight to spread their wings and bask for hours in the sun.

For breeding purposes vast numbers gather on precipitous cliffs and rocky islands on the ledges of which three or four eggs with white chalky shells are deposited on a bed of dry seaweed, etc. Along with those of other birds of similar habits the eggs are much sought by professional egg hunters.

That the services of birds, which are such excellent fishers, should be desired by man, is by no means surprising, and it is well known that the Chinese and Japanese have long trained cormorants to fish for them. This training is begun by placing a ring on the lower part of the bird's neck to prevent it from swallowing its prey. After a time the cormorant learns to deliver the fish to its master without having the ring on its neck. It is said to be a very interesting sight to observe the fishing boats, having but one or two persons on board and a considerable number of cormorants, which latter, at a signal given by their master, plunge into the water, and soon return, bringing a fish in their mouths, which is willingly relinquished. In some parts of Europe frequented by species of the cormorant, they commit great depredations on the fish ponds which are kept for the purpose of supplying the tables of the proprietors, and in Holland they are said to be especially troublesome in this way, two or three of these greedy birds speedily clearing a pond of all its finny inhabitants. From their great voracity and entirely piscivorous regimen, it will readily be inferred that their flesh promises very little to gratify the epicure.

Phalacrocorax carbo, the common cormorant, or shag, is found on the coasts of both sides of the north Atlantic, in America migrating in winter as far south as New Jersey or beyond. In England this species was formerly trained to catch fish, and fishing with cormorants was a pastime much in vogue with the devotees to falconry and is still practised by a few gentlemen. The double-crested cormorant (*P. dilophus*) is confined to the northern parts of eastern North America, frequenting both fresh and salt water, and a southern form, which is now regarded as a variety of this species, is very abundant about the mangrove thickets of Florida. Cormorants are especially numerous on the Pacific coast of North America, where at least five species and several additional varieties occur, and other representatives of the family are found throughout the world.

Consult: Baird, Brewer and Ridgway, 'Water Birds of North America.'

Corn (from French *corne*, from Lat. *cornu*, a horn, from its horny nature), a hardened portion of cuticle produced by pressure. Corns are generally found on the outside of the toes, but sometimes between them, on the sides of the foot, or even on the ball. They gradually penetrate deeper into the parts, and sometimes occasion extreme pain. No part of the human body, probably, has been injured so much by our injudicious mode of dress as the feet, which have become, in general, deformed. To this general deformity of the foot belong the corns, produced by the absurd forms of our shoes and boots. They appear at first as small dark points in the hardened skin, and in this state stimulants or escharotics, as nitrate of silver (lunar caustic), are recommended. The corn is to be wet and rubbed with a pencil of the caustic every evening. It is well to have the skin previously softened. If the corn has attained a large size removal by a cutting or ligature will be proper, if it hangs by a small neck it is recommended to tie a silk thread round it, which is to be tightened every day until the corn is completely removed. In all cases of cutting corns very great precaution is to be observed. The feet ought always to be bathed previously. Mortification has, in many instances, resulted from the neglect of this precaution, and from cutting too deep. Perhaps the most efficacious remedy for corns is the application of glacial acetic acid night and morning. This acid has a peculiarly destructive effect on the epidermis, of which corns are a hypertrophy. Another simple and generally very efficacious means, is the application of a thick adhesive plaster, in the centre of which a hole has been made for the reception of the projecting part. From time to time a plaster must be added.

Corn, the generic term for all kinds of grain used for making bread, and is applied specifically to the principal breadstuff; in England to wheat, in the United States to Indian corn

or maize, and in Scotland frequently to oats. The word is Anglo-Saxon, and occurs in similar forms in the other Teutonic tongues. The words seem to have been used in ancient times as at present, having a different meaning in different countries.

Corn, Indian, also called maize, is an endogen which grows luxuriantly in warm temperate climates. It belongs to the tribe of *Phalaridæ* of the order of *Gramineæ*, or grasses. It is known in botanical science by the name *Zea mays*. The flowers are monœcious; the male flowers forming a loose panicle at the top of the culm; the female flowers in axillary spikes, enclosed in large, tough spathes, from which only the extremely long styles — in the common species six to eight inches in length — hang out like tufts of feathers or silken tassels. The grains are large, roundish, compressed, naked, and arranged in parallel rows along the upright axis of the spike. The long parallel-veined leaves and the stalks are often used as fodder. The common Indian corn is generally believed to be a native of the warmer parts of America, where it was cultivated by the aborigines before the discovery by Columbus; but a representation of the plant found in an ancient Chinese book in the royal library in Paris, and the alleged discovery of some grains of it in the cellars of ancient houses in Athens, have led some to suppose that it is a native also of the East, and has, from a very early period, been cultivated there, and even that it is the "corn" of Scripture; although, on this supposition, it is not easy to account for the subsequent neglect of it until after the discovery of America, since which the spread of its cultivation in the Old World has taken place with a rapidity such as might be expected from its great productiveness and other valuable qualities. Columbus himself took it to Spain. When first introduced into Europe, many supposed it was brought from Asia, and it was frequently known as Turkey corn, Turkey wheat. See *Zea mays* in CORN CULTURE.

The principal Indian corn-producing countries of the world are Argentina, Austria-Hungary, Bulgaria, and Eastern Rumelia, Canada, Egypt, Italy, Rumania, Russia, the United States, and Uruguay. The combined production in the calendar year 1899 was estimated at 2,611,000,000 bushels, the yield of the United States alone being 2,078,143,933 bushels, valued at $629,210,110; in the calendar year 1900 the production was 2,105,102,516 bushels, valued at $751,220,034. In the United States alone, in the year 1901 there were raised 1,522,520,000 bushels of corn.

Corn Culture. The profitable production of corn depends upon: (1) fertility of soil; (2) conditions of climate; (3) quality of seed; (4) methods of cultivation.

Fertility of soil is the first and most important of these conditions. Three elements, nitrogen, phosphorus, and potassium are important constituents of soil fertility, and the ones which are frequently lacking in quantity in the soil's composition, or become quickly exhausted by continuous cropping without proper rotation of crops or application of manures. In those regions where corn is most extensively grown, as in the Mississippi valley of the United States, the fertility of the virgin soils seemed almost unlimited to the pioneer farmers, who in many instances grew crop after crop of corn, selling the product off the land without apparently diminishing the productiveness of the soil. However, after a half century of such practice, it has been found that the soil has been exhausted by this system of farming. The depleted soils are found to have an insufficient supply of the important elements necessary to render them fertile, and that it has become necessary to resupply them directly in the form of commercial fertilizers, or indirectly, through the use of barnyard or other like manures, or by the growing of green manure crops.

Effect of Continuous Corn Growing.— In order to show the effect of continuous corn growing on typical corn soil, the results of an experiment conducted by the Illinois Agricultural Experiment Station will be presented. In this experiment, corn has been grown on a field of the college farm for 24 years without the application of any kind of manure or fertilizer. The 24 crops have been carefully harvested and weighed, after which the stalks and ears were removed from the field. The experiment was begun 10 years before the organization of the experiment station in 1888, therefore records have been kept for only the last 14 years.

The records of yields from 1888–1901 were as follows:

YEAR	Ear Corn	Stover	YEAR	Ear Corn	Stover
	bushels	tons		bushels	tons
1888.....	60.13	1.26	1895.....	63.81	1.51
1889.....	47.15	1.21	1896.....	62.31	1.74
1890.....	41.87	1.19	1897.....	40.10	1.61
1891.....	26.67	1.23	1898.....	18.11	1.39
1892.....	30.92	.75	1899.....	59.09	1.61
1893.....	21.73	1.04	1900.....	48.03	1.29
1894.....	34.83	1.26	1901.....	23.65	1.14

The most valuable results of this experiment will be secured in the tests of the coming 25 years, but the present table is extremely interesting in that it points to the ability of the prairie loam soil to sustain a high yield for a comparatively long period, and the fact that there are strong indications of exhaustion of plant food. In adjoining fields under a system of rotation and manuring, the yields show that by comparison the field continuously in corn is being slowly but surely depleted of its fertility. There is a similarity between these results and the results of the first 25 years tests of growing wheat year after year without manures in the Broadbalk field at Rothamstead, England. In these latter experiments, the second 25 years of wheat cropping showed an increasingly rapid decrease of yield. Further experiments revealed the fact that it was very difficult to bring this exhausted soil back to a state of profitable productiveness. It has become a generally accepted fact that continuous cropping without manures of any kind exhausts the fertility of the soil, injures its mechanical condition, and eventually becomes an unprofitable practice to pursue.

Methods of Restoring or Maintaining the Fertility.— There are several methods which are practised with economical results in the corn belt of restoring exhausted corn lands to a fertile condition, and of keeping up the fertility

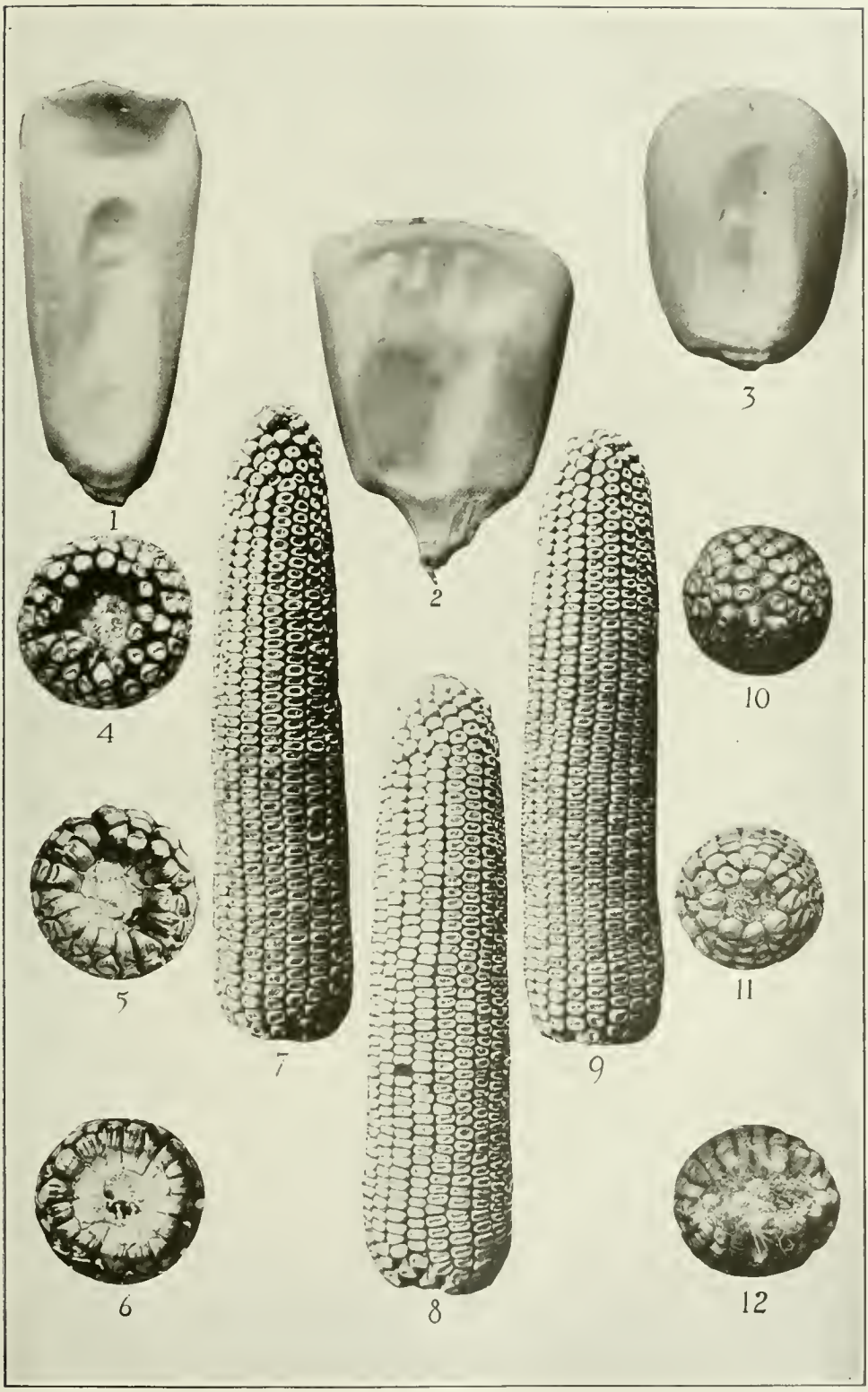
of such soil under cultivation. It will be impossible to treat of many of them in detail here, so that only a few of the principal plans will be outlined.

Commercial Fertilizers.— The use of commercial fertilizers for corn land is limited to those soils which are lacking in one or more constituents of plant food which can be bought in the market, either alone or in combination, at a reasonable cost, usually, nitrogen, phosphorus, potassium, or lime. Their general use is limited from the fact that the cost of supplying plant food in this way is so great that the returns in crops like corn do not usually justify the outlay. Nitrogen costs about 15 cents; phosphorus, seven cents; and potassium four cents per pound, when purchased in artificial fertilizers. From the fact that a large quantity of these constituents are removed in a crop of corn it can be seen that it would be unprofitable to use them for the growing of a crop without having as a basis a soil naturally sufficiently supplied with one or more of these elements. In some cases it may be advisable to apply one or more of these constituents to correct some unusual soil condition, but the large areas which are naturally rich in all necessary elements of plant food for corn, and adapted in all conditions for growing corn, precludes their general use for this purpose by the corn growers of the United States.

Barnyard Manure.— Barnyard manure contains a large supply of plant food, and when applied to the soil not only increases its fertility, but improves the mechanical condition, or tilth, as well. The large amount of straw and vegetable matter in its composition, when decomposed and assimilated by the soil, improves its condition for corn crops. In fact it has come to be a generally followed practice among our most progressive farmers to feed the corn crop to live stock, carefully conserving the manure for application to the soil. In such cases, the best plan seems to be to compost the manure, and after it has become well-rotted, to spread it on the field while the soil is frozen in winter, plowing it under to a good depth in the spring. This practice can be followed only where local conditions permit. On soils that leach or are carried off by rains it is necessary to apply the manure at the times when it will not be washed off the soil by winter or spring rains, or wasted from other causes. In such cases, the manure may be spread on grass lands or pastures in the spring or summer, the field being plowed for corn the following autumn or spring. About 10 tons of well-rotted manure per acre is considered a sufficient application for ordinary corn land.

Green Manure Crops.— The most important method of maintaing the soil's fertility is by the use of green manure crops, such as, clover, cowpeas, soy beans, and alfalfa. These crops add to the supply of nitrogen in the soil under favorable conditions and when plowed under improve its tilth. When harvested they constitute a valuable feed for live stock. The addition to the plant food supply of the soil by the growth of leguminous crops is accomplished in two ways: Firstly, by the presence and growth of certain organisms peculiar to these crops, inducing the development of root tubercles. These organisms have the power of drawing upon the free and unavailable nitrogen of the atmosphere and converting it into an available and useful condition for plant food. Secondly, from the fact that these crops root deeply as a rule, drawing upon plant food in the soil, which is not in position for use by ordinary crops. This food is assimilated by the plants, so that when the crop is plowed under the decomposition of the roots and stems, leaves this plant food where it can be gotten at and used by corn or other plants. In addition to the above desirable qualities, these green manure crops tend to break up and make heavy soils more porous. In this way more air and water is admitted into the soil, resulting in the bringing into usuable form some of the otherwise insoluble plant food. Clover can be seeded in the corn at the time of the last cultivation, and if the season is favorable it will make sufficient growth during the rest of the summer and autumn, even in the shade of the corn plants, so that by plowing under the crop late in the fall or early the next spring, considerable benefit will be derived from it. The best plan, and the one most usually followed in the corn belt, is to seed the clover in an oat crop, allowing the clover one year's growth, then plowing under the clover crop in the fall, corn being planted the next year. If it is desirable to harvest the clover hay for feed, it is necessary to follow the latter plan. A second crop containing seed may be secured the same season. However, the removal of two crops from the field in a season, takes out of the soil a large amount of plant food, so that the beneficial effect of the growth of the clover is partly or largely lost. If the clover crop is harvested instead of being plowed under, and the hay fed to live stock and the manure conserved and spread on the fields which are to be planted in corn, the benefits of the clover crop can be retained. If the clover crop is plowed under it should be covered to a good depth, long enough before the corn crop is planted to allow decomposition to take place, so that the mass of plants will not interfere with the natural condition of the soil.

Cowpeas and soy beans are leguminous crops, introduced into this country recently from Asia, and are coming to be grown on a large scale as green manure crops for the preparation of the land for corn. They are somewhat similar in their habits of growth so far as season is concerned, but the soy bean seems to be especially adapted to a rich prairie loam soil, while the cowpea is more suited to clay or sandy lands. The seed of these crops can be sown in the corn between the rows after the last cultivation, either broadcast and then harrowed in, or drilled in with a small drill which runs between the corn rows. In such cases the crops of beans or peas should attain about a two thirds normal growth in an ordinary season with a reasonable amount of rainfall. The crop can then be plowed under, either late in the fall or early the next spring, preparatory for corn. They can also be planted alone, and as they yield valuable returns, this practice seems to be the better plan. In this case it requires an entire growing season to secure a crop, but if the crop is harvested either for hay or seed, and the manure obtained from feeding the crop to stock be returned to the soil, the benefit is such as to justify the use of the land for this purpose. Other crops such as alfalfa, vetch, horse beans, and various other species of leguminous plants



1. Wedge-shaped kernel. A desirable type.
2. Square kernel. Undesirable type.
3. Round kernel. Most undesirable type.
4. Well-filled butt of ear. A desirable type.
5. Medium-filled butt of ear. An undesirable type.
6. Poorly-filled butt of ear. Most undesirable type.
7. Cylindrical ear with straight rows of uniform kernels.
8. Cylindrical ear with straight rows of uniform kernels.
9. Nos. 7, 8 and 9 illustrate a desirable kind of selection of uniform ears.
10. Well-filled tip of ear. A desirable type.
11. Partly uncovered tip. Undesirable type.
12. Most undesirable type of tip of ear, poorly filled with irregular and small kernels.

are used for improving the soil. Local experiments are necessary to determine the crop best suited to any given set of conditions, from the fact that there is no general crop adapted to all conditions. The exact nature of the benefits of a rotation of such crops with corn have not been recorded in any given set experiments, but numberless instances might be cited of an increase of from 5 to 25 bushels of corn per acre as the result of the growing of a leguminous crop the preceding season.

In summing up the important points as regards the condition of the soil for corn, it may be said that continuous cropping without rotation or manuring seems inadvisable, and results in the exhaustion of the fertility of the land to such an extent as to render it an expensive process to bring it back to a state of productiveness. Commercial fertilizers are expensive agents for maintaining the food supply for corn, and cannot be successfully used except for local or peculiar conditions or for the correction of some unusual occurrence, as the acidity of certain bog soils, or the small alkaline areas in the fields in certain sections of the middle West. The most successful and profitable plan adapted to most conditions seems to be a rotation of corn with some legume, preferably one which can be used to supplement corn as a ration for live stock, and the feeding of all crops followed by the return to the soil of the plant food in the shape of composted manure.

Climate.—*Zea mays* originated in all probability in Mexico. From Mexico it was carried North by the Indians by means of barter and trade, so that when the early explorers of America visited the section now included in the United States they found considerable areas under a crude system of corn cultivation by the Indian tribes. Upon the development of the vast sections of the Mississippi valley, corn became the principal crop, and is now recognized as the leading American cereal. From America this crop has been carried to all continents of the world, and is grown to a greater or less extent in most of the leading countries, especially in those in which the climate and soil conditions are similar to those of our Mississippi valley region. Corn flourishes best in those sections having an annual rainfall of about 30 inches, or an artificial supply by irrigation, and a season of about 120 days for the maturing of the larger types. The crop seems to reach its best development in the temperate regions, where a part of the season, the time of greatest growth, has warm days and nights. Under such conditions the plants grow with great rapidity. Corn readily responds to climatic conditions; namely, by taking a late variety to a region of short seasons, an early variety can be developed by selection, and *vice versa*. For this reason, we have races of corn which vary greatly in their characteristics, due to the adaptation to climatic conditions. It is not a good policy to suddenly remove a race, suited to a peculiar set of conditions, to very different conditions. Under such circumstances the crop may fail to mature, or may develop some quality detrimental to its value. It is probable that by selection, races may be improved for any given corn region, and that by continued breeding and selection, these races may be further improved without resource to the importation of seed from other sections. However it seems that there are certain conditions in which corn naturally reaches its highest and fullest development, and it is probable that in those sections most advance will be made in the permanent improvement of corn. It may be advisable for corn-growing sections not specially suited for corn growing to occasionally secure a small supply of breeding seed from the best corn regions, which after a few years' growth will have become suited to the new conditions and may have a better type than those which have been grown in the less favorable localities.

One of the important things which has been neglected for the most part, in so far as climatic conditions are concerned in corn culture, is the systematic comparison of different races from different regions, in order to find those races which are the best naturally suited to local conditions. It is probable that before breeding is begun, it would be advisable to make such a test in order to determine the best breeding stock for permanent improvement.

Quality of Seed.—There are a number of races of dent corn (*Zea indentata*) which for the most part are the result of the selection of sports or striking variations. The individuals of these races are not uniform, and from the fact that corn is normally cross fertilized, a pure race frequently becomes mixed with other races. In fact there are practically no pure races under general cultivation, and owing to the difficulty of maintaining the pure type, little attention has been given to systematically breeding these races. As a rule the seed corn used for planting the crop of the world is subject to little, if any, intelligent selection of seed ears. Considerable fraud has been practised by unscrupulous seed dealers in the past, who in order to humbug the public, bought up ordinary corn, gave it a fancy name, advertised it widely without careful tests and through extravagant claims for its productiveness, obtained a wide sale, with consequent loss to the farmers buying the seed, but with considerable financial gain to themselves. An illustration of this practice is found in the case of a certain seed dealer in the corn belt who bought up a large crop of ordinary southern corn. This corn was not adapted to the conditions of growth in the corn belt and was an unprofitable type of corn for any set of conditions. The dealer widely advertised that he had secured this seed as the result of growing for a number of years a few ears of seed which he had discovered buried in an Indian mound. This seed was claimed to have probably been preserved for hundreds of years in the mound and according to the statements of the dealer, when planted gave marvelous results, yielding several hundred bushels of ear corn per acre. The seed corn was sent out shelled to the farmers so that little idea could be gained of the character of the ear, or the habit of growth. This seed was sold for several dollars per bushel, and as a result of the wide advertising, many thousands of bushels were distributed to growers over the corn belt. When the seed was planted only a small per cent sprouted, the plants grew into excessively large stalks bearing small ears, and only a small per cent of the stalks produced ears at all. As a result, the crop was almost a total failure and caused a great loss to the growers. This one example is typical of a general practice in the past, consequently most corn growers became

skeptical of all attempts to improve the races of corn.

Pioneer Corn Breeders.—Previous to 1900, little was done in the way of the systematic improvement of corn. A few men early in the last century realized the value of carefully selected seed, and began to select their corn with reference to some type particularly desirable to them. One of these men was James Leaming, of Wilmington, Ohio, who began the selection of the ordinary yellow corn of the Miami valley for larger and heavier ears. His idea was to secure ears with small cobs, deep grains well filled over the tips and butts, which would mature under his conditions of soil and climate. In order to get early maturity he naturally selected a rather tapering type of ear. This seed was carefully preserved during the winter, and all irregular kernels, such as tip and base kernels, were discarded before planting. Mr. Leaming began this work about 1825, and continued the selection of his type of seed for more than half a century, keeping the race as pure as possible. Some of the pioneers of Illinois, Iowa, and other western States, carried seed of this race with them from Ohio to their new homes. It was found that under the very favorable conditions of the Mississippi valley this race improved in size of ear, depth of kernel, and productiveness. Naturally, it was carried over a large territory and during the past few years has been the subject of considerable attention by corn breeders who have effected further and marked improvement in the feeding quality and yielding power. The Improved Leaming strains of to-day bear little resemblance to the original Ohio stock, and are living evidences of the possibilities in careful selection of seed corn.

Another pioneer in the work of the improvement of corn and the establishment of new races was James Riley, of Thorntown, Indiana. Mr. Riley began the selection of the ordinary white corn of his community about the middle of the last century. He was convinced that by the selection of large well-developed ears for seed, and the weeding out of barren stalks before pollination, a large-eared, uniform type of corn could be secured. By persistent planting of such seed ears in isolated fields, preventing mixture with other types, he achieved success in this work, and produced a race called the Boone County White, which stands foremost among all races of white corn grown in the corn belt. Other races were produced by Mr. Riley, among them a yellow type, which he called Riley's Favorite. The production of this race is interesting because it illustrates the development of new types by crossing, and fixing of type of the hybrid by selection. He crossed a large and late southern race of yellow corn on a small, early maturing, northern yellow race, his aim being to secure a new race having a medium or large ear and early maturity. He accomplished this object successfully, and the Riley's Favorite is now largely grown in northern parts of the corn belt.

Improved Races are Most Productive.—The results of these systems of selection are shown by the comparative tests of races of corn at the Illinois, and other State agricultural experiment stations. It has been found that during a series of 10 years' tests of comparative yields per acre, the Leaming and Boone County White varieties of corn have consistently and on the average for 10 years outyielded all other races. In fact, it has been shown that under widely different conditions, these two races have yielded more than double the amount of the ordinary types of corn. It has further been shown that corn growers who have selected these races for feeding purposes, have naturally selected the types which were most beneficial for feeding purposes, and have developed strains which have a chemical composition better suited for feeding than the ordinary races of corn now grown in any region.

The benefits of improved seed corn are that larger returns are secured with the same effort required to produce ordinary and smaller yields. It does not cost any more to grow a race of high yielding power, possessing a desirable proportion of protein for feeding purposes, or of oil and starch for manufacturing purposes, than to grow the ordinary types of corn. Taking into account the great area devoted to corn in the United States, about 100,000,000 acres, even a slight increase in yield per acre, or a small improvement in quality, means an enormous increase in the profit from breeding. The past five years have demonstrated the practicability of such improvement beyond a doubt, and the results obtained on the farms and by experiment stations, have attracted world-wide attention.

Corn Breeders' Association.—The organization of the Illinois Seed Corn Breeders' Association, in June 1900, marked the beginning of a widespread attempt to put corn breeding on a similar basis to that of live stock breeding. In fact, it has been found that corn breeding follows the same general laws as the breeding of animals. In other words, corn can be bred like cattle. This organization was founded by a few men, extensive growers of corn, and in most cases, noted breeders of live stock, who resolved to begin a careful selection of their own seed for planting, and if favorable results were obtained to offer such seed for general planting in regions suited to the development of the races they selected for breeding. All seed sent out by members of the association was carefully inspected by an officer of the State experiment station, tested for vitality, and examined for uniformity, trueness to type, and freedom from mixture with other types of corn. All seed sold was sent out in the ear so that the man who purchased the seed could see for himself the type and character of the seed sent to him. The success of the plan was so great that other States at once followed the lead of this organization, and at present Iowa, Kansas, Nebraska, Indiana, and Maryland have corn breeders' associations, comprised of men who are systematically selecting their corn, for the most part in co-operation with the State Experiment Station. By means of such organized efforts, States have appropriated large sums of money for further experiments in corn breeding and culture so that progress is being made in this work at a rapid rate and valuable results obtained of wide application and importance.

Some Standard Races of Corn.—The Illinois Seed Corn Breeders' Association recognize eight distinct races of corn, which are the basis for the development of many strains produced by individual breeders. These races, date of beginning selection, originators, and place or origin are as follows:

Boone County White, 1876, James Riley, Thorntown, Indiana.

Silver Mine, 1890, J. H. Beagley, Sibley, Illinois.

White Superior, 1880, P. R. Sperry, Monmouth, Illinois.

Leaming, 1826, J. S. Leaming, Wilmington, Ohio.

Reid's Yellow Dent, 1846, J. L. Reid, Delavan, Illinois.

Golden Eagle, 1871, H. B. Perry, Toulon, Illinois.

Riley's Favorite, 1885, James Riley, Thorntown, Indiana.

Pride of the North, about 1890, F. A. Warner, Sibley, Illinois.

This ear was carefully planted in an isolated patch, and the crop carefully harvested and planted the next season in isolated fields. From this source the seed was obtained for the first general distribution, which has been followed by breeding experiments, and breeders taking up the race for continued improvement by selection.

In order to show some of the characteristics which go to make up a type, which are considered in the study of a race, the following table of characteristics of seven leading races of corn is presented.

One further result of the organization of corn breeders' associations has been the holding of exhibits of samples of corn selected by

NAMES OF VARIETIES.

	Reid's Yellow Dent	Golden Eagle	Riley's Favorite	Leaming	Boone County	Silver Mine	White Superior
Ear: Shape	Slowly tapering	Slowly tapering	Slowly tapering	Tapering	Cylindrical	Cylindrical	Slowly tapering
Length	10 inches	9 inches	9 inches	10 inches	10 inches	9 inches	10 inches
Circumference	7 inches	7 inches	7 inches	7 inches	7½ inches	7 inches	7 inches
Kernel: Condition	Firm upright	Loose upright	Firm upright	Firm upright	Firm upright	Firm upright	Firm upright
Color	Light yellow	Deep yellow	Deep yellow	Deep yellow	Pearl white	Cream white	Starch white
Indentation	Medium smooth	Very rough	Rough	Rough	Rough	Very rough	Medium rough
Shape	Long wedge	Broad wedge	Medium wedge	Medium wedge	Medium wedge	Broad wedge	Very broad wedge
Rows: Number	18-24	16-20	16-20	16-24	16-22	16-20	18-20
Space	Narrow	Medium	Medium	Medium	Medium	Narrow	Medium
Arrangement	Pairs	Distinct	Pairs	Pairs	Pairs	Pairs	Pairs
Butts: Filling out	Deeply rounded, compressed	Moderately rounded, compressed	Moderately rounded, compressed	Moderately rounded, compressed expanded	Moderately rounded, compressed	Moderately rounded	Shallow rounded, depressed
Tip: Filling out	Regular rows of kernels	Regular rows of kernels	Regular rows of kernels	Irregular rows of kernels	Regular rows of kernels	Regular rows of kernels	Regular rows of kernels
Shank: Size	Small	Small	Small	Medium	Medium	Small	Medium
Cob: Size	Medium	Small	Small	Medium	Medium	Small	Medium
Color	Deep red	Deep red	Deep red	Deep red	White	White	White
Per cent of corn	88	90	90	88	86	90	88

From the growing of these races under widely varying conditions, and the effect of selection by individuals having different types in mind, a great many strains have been developed, which in time will probably come to be recognized as distinct races. New races will probably spring up as a result of the selection of naturally prepotent individuals whose projective efficiency is great enough to impress distinct characteristics upon the offspring and create new and dominant types. An illustration of this method of origin of new and dominant races from striking individuals, is found in the history of the Silver Mine race. According to the statement of the originator it sprung from a single ear, which was of such perfection that it attracted this grower's attention among an exhibit of several thousand ears of corn.

men who compete for certain prizes. In several instances, the number of samples brought together in such exhibits has exceeded several thousand, and in one or two instances the number of samples of 10 ears each has reached 10,000. The effect of such exhibits has been to awaken a wide general interest in improved types of corn, and the methods and standards for judging these samples. During the past 10 years, score cards and standards of perfection have been devised, which by continued revision have been developed to a state of great usefulness. The use of the score card is to compare on a uniform basis, individual samples of a given race of corn. Owing to the fact that in the production of races for different purposes, and for different conditions, characteristic differences in shape, size, and other qualities have

been developed, it has become necessary to have a standard for each of the established races.

The Score Card.— The score card in use in Iowa illustrates the general type of score card, and in order to illustrate the work of judging corn, this score card is outlined as follows:

Characteristics	Number of points
1. Trueness to type or breed. Characteristics	10
2. Shape of ear	5
3. Color of ear	5
Color of grain	5
4. Market condition	5
5. Tips	10
6. Butts	10
7. Kernels — Uniformity	5
Shape	5
8. Length of ear	10
9. Circumference of ear	5
10. Space — Furrow between rows	5
Space between kernels at cob	5
11. Proportion of corn to cob	15

In order to use the card intelligently the following explanations are necessary:

1. The sample of 10 ears should be uniform and conform to the race characteristics.

2. The shape of ear should conform to race type.

3. Color of grain should be the characteristic color of the race. Single kernels which vary in color from the rest of the ear indicate xenia and consequent crossing of types. In general, yellow ears should have red cobs, and white ears, white cobs.

4. The ears should be sound, free from injuries, especially those due to germinating kernels and decomposed grains.

5. The tips should be well filled out with uniform-sized kernels. This point should be carefully considered, as a good ear may have from accident of season, or other reason, not received enough pollen to fully fertilize all the kernels on the cob. The ear is an axis upon which the kernels are borne. While an ear which is fully filled out over the tip and butt is preferable to one not so well covered, it may be that the uncovered tip is the presence of a variation of unusual length which developing out of the ordinary time of pollination has not received pollen. It may be desirable to preserve this type, from which in time a type may be developed, producing sufficient pollen and at the proper season for the fertilizing of the entire lengthened ear.

6. The butts of the ears should be regularly filled out with uniform kernels, and the size of the opening to the cob indicates the size of the shank attaching the ear to the stalk. Too large shanks are objectionable on account of difficulty in husking, while too small ones are likely to let the ear drop off the stalk before maturity and cause a corresponding loss to the grower.

7. One of the most important points in the selection of seed ears is the uniformity of kernels in the ear, and as between individual ears. Any irregularity is likely to give rise to uneven stands of corn in the field from lack of a regular drop in the ordinary planter. They are further undesirable because they are usually subject to greater or less loss of vitality. The most desirable condition is where the ears are uniform in number of rows of kernels, and the kernels are uniform in shape, size and general characteristics on the individual ears.

8. We have come to believe that an obtuse wedge-shaped kernel of proper proportions is the most desirable type. Such kernels should have straight sides and edges so that they fit together on the ear with the least possible space between the individual kernels or rows of kernels from the tip to the tops of the kernels. Space between the tips of the kernels results in thin pointed kernels, indicating a lack of constitution and a loss in weight of kernels, making the so-called chaffy ear. Space at the tops of the kernels results in a loss of weight, and is usually accompanied by large rounded kernels, correlated with few rows of kernels on the ear. Therefore in a well-developed ear there should not be any space between the kernels.

9. The proportion of corn to cob indicates the relative size of cob and weight of shelled corn. In general it is desirable to have as large a proportion of corn to cob as is consistent with the total size of ear. The desirable size of ear will depend upon conditions, but other things being equal, the ear should be as large as will mature under the conditions of soil and climate in any given locality.

10. The proportion of corn to cob, the circumference of ears, and the length of ears is given in the foregoing table of characteristics for the standard varieties. Variations in these standards will be developed upon the growing of different strains under different conditions.

Corn Breeding.— Systematic corn improvement by breeding and selection has accomplished results of very great benefit to the corn growers of the United States. The principle underlying the methods of selection is to plant the individual ear by itself so that record may be kept of its production and general performance. The best ears are selected for an isolated field so that intercrossing with undesirable types may be prevented. The ears selected for breeding stock are usually planted in rows, or plats, an ear to a row or plat, and care taken to secure the best possible development of the crop. At the time of tasseling, the tassels of all barren stalks, suckers, and other undesirable stalks are removed in order to prevent the desirable ears from possible pollination through this source. At the end of the season, the rows or plats are harvested separately and the yield of each carefully determined. The seed for the next year's breeding field is selected from those rows which give the highest yield of desirable type of ears. The next best seed may be used for planting the general crop, or for planting a field for the production of general seed corn. In this way, a record may be kept of the development of the ears used for seed breeding, and a pedigree system established for the lines which show desirable characteristics. Such corn registers make it possible for a buyer of seed corn to secure pedigreed strains, much in the same way that the breeder of live stock secures a pedigree of the animals he purchases for breeding purposes. Such a system will do away in a large measure with any fraudulent practices and permit the corn grower to secure seed of known productiveness.

Vitality of Seed.— One of the most important factors entering into the production of the corn crop is the vitality of seed. In planting the ears in individual rows or plats, one of the most notable facts which strike the observer, is the great irregularity of size of plants in the

different rows. One row, for instance, will be on the average a foot higher than the adjoining row and so on throughout the entire field. This irregularity in growth and finally in productiveness was not shown in the seed ears, because in most cases, the seed ears were so carefully selected for uniformity that they were absolutely alike to the casual observer. This difference in vigor of growth is due, in great measure at least, to differences in the vitality of the seed. This vitality means the life of the seed, which is affected by age, storage, heredity, and many other factors. The degree of vitality by the seed ear can be partially measured before the seed is used for planting. No absolute measure can be made of the value of the seed ear, but a comparatively accurate idea may be gained of the vitality by means of the germination test. We believe that the kernels in the individual ear are considerably alike in composition and in vitality, in fact all general characteristics. It has been found that there is a slight variation between the individual kernels in the ear, but that this variation is not as great as the variation between different ears; so that by testing the vitality of the individual ears the most vigorous may be picked out for planting the breeding field. This test can be made by taking out three kernels from near the tip, three from near the middle, and three from near the butt of every ear. In cases where possible, it is more desirable to shell off two rows of kernels from each ear and test all of the kernels in each row. The kernels should be planted in moist sand, point down, or laid between layers of moist cloth. In this moist condition, and under a temperature of about 70° F., 95 per cent of the kernels should sprout inside of three days, and should have sprouts one inch long at the end of five days. If the seed germinates more slowly than this standard, it is an indication of weakened vitality. In other words, the time required for germination is the indication of the degree of vitality. Weak seed of slow germination should be discarded, as it results in a poor stand, the most frequent cause of loss of profits to the grower.

Effect of Methods of Storing Seed Corn.— The usual practice among corn growers is to select the seed corn out of the general crib, in the spring just before time for planting. In some instances, especially during years unfavorable for the maturing of the corn crop, it has been found that such seed was weak in vitality and only a partial stand was secured. In fact, it has been found that seed corn containing a high per cent of moisture is most easily affected by cold weather, while well-dried seed is capable of withstanding cold with the least possible loss of vitality. The amount of moisture in seed varies with the conditions of maturity, immature seed containing an unusually large amount of water, while fully matured seed contains a low per cent of moisture. The dryness of the seed when harvested does not always indicate the amount of water contained, as corn absorbs moisture from humid atmospheres, and imparts it to dry air. That the condition of the seed as regards the effect of cold and other factors upon the vitality is correlated with productiveness is shown by experiments conducted by Mr. C. P. Hartley, of the United States Department of Agriculture, upon the keeping of seed corn during the winter. In this experiment Mr. Hartley tested the yield of seed corn which was fire dried, namely, dried with artificial heat and kept at a steady temperature, compared with similar seed stored in the open crib, not so dried, and exposed to the atmospheric conditions of temperature and moisture. It was found that the crop from the fire-dried seed outyielded the crop from the ordinarily treated or air-dried seed, the most marked case showing a difference of 18¼ bushels in favor of the fire-dried seed, the average yields being 85.59 bushels per acre from the fire-dried in comparison with 67.34 bushels from the air-dried seed. It is probable that the condition of the seed during storage affects its vitality and in turn the yield per acre, so that it is advisable to keep the seed dry during the winter, and protected from extremes of temperature.

Methods of Cultivation.— The methods of corn cultivation vary with the conditions of soil and climate. No definite rules can be laid down for all conditions, in fact, every corn grower must determine for himself the best methods suited to his peculiar conditions. However, there are certain general principles of plant growth which hold true under all conditions, and it will be the object of this discussion to point out the practical application of some of these principles.

Methods of Preparing the Seed Bed.— The methods of preparing the seed bed for corn can best be illustrated by the results of an experiment to test this point, conducted by the Illinois Agricultural Experiment Station, during the season of 1903. The experiment resulted as follows:

EFFECT OF PREPARING THE SEED BED.

(Yield in bushels per acre.)

	Trial No.	Field	Field	Field	Av'rage
A. Plow, *drag, let lie, disk, harrow, plant..	1	65.3	71.3	49.9	
	2	72.1	77.3		
	Ave.	68.7	74.3	49.9	64.3
B. Plow, let lie, harrow, plant.....	1	77.4	96.6	43.0	
	2	70.0	74.0		
	Ave.	73.7	85.3	43.0	67.3
C. Disk, plow, drag, disk, harrow, plant..	1	72.7	134.7	46.2	
	2	69.4	73.3		
	Ave.	71.1	104.0	46.2	73.8

*By drag is meant the implement made of boards or timbers which is used for smoothing the surface of the seed bed and to crush lumps of earth.

This table and general experience goes to show that in the ordinary season, it pays to disk or stir the land before plowing, plowing to a depth depending upon the nature of the soil, and keeping the land stirred until the time of planting. This constant stirring of the soil breaks up the capillarity and prevents the escape of soil moisture, at the same time getting the seed bed in good mechanical condition for the reception of the seed.

Conservation of Soil Moisture.— In the first place it is necessary to supply the corn crop with a large supply of water for growth. It has been estimated, by careful experiments, that for every pound of dry matter produced, the plant uses 300 or more pounds of water. When one considers the great yield of the corn crop in large areas and the necessary amount of water to produce this yield, it can easily be seen how important the conservation of soil moisture be-

comes. The moisture in the soil escapes by capillarity and by drainage. In order to prevent the loss by capillarity, it is necessary to break up the soil condition which conduces to capillary action. This is practically accomplished by plowing, and continued stirring of the surface of the plowed land during dry periods, or by the use of the disk or cultivator. The loss of water by washing or drainage is prevented as far as possible by bringing the land into such condition as to readily take up and hold the rainfall and all moisture that falls upon it. This latter plan is accomplished by sub-soiling, deep plowing at the proper season, growing of such crops as clover, cowpeas, etc., in the rotation, and the addition of humus to the soil, as by plowing under corn stalks, straw, barnyard manure, or other means. When the soil is in good condition and rich in plant food, it is probably in the best possible condition to retain the soil moisture for the use of the crop.

Thickness of Planting.— The thickness of planting best suited to give the most profitable results will depend upon the race of corn, the nature of the soil, the character of climate, the purpose for which the crop is produced, and other factors. However, if yield alone is considered, the following table gives the most reliable data yet obtained on this point:

EFFECT OF THICKNESS OF PLANTING.

(Yield in bushels per acre.)

No. stalks per hill	Field 1	Field 2	Field 3	Field 4	Field 5	Average
1	28.7	41.5	42.6	55.5	36.3	40.9
2	55.0	79.9	67.3	72.8	53.3	65.7
3	67.4	88.8	80.6	86.2	59.6	77.7
4	73.1	82.8	90.4	88.4	53.0	77.5
5	84.5	89.1	98.8	90.2	53.0	83.1

This table indicates that which has been found to be true under general conditions that four to five stalks on good corn land with ordinary seed will give the largest yield, but where machinery is not used in harvesting it is probably more desirable to leave three stalks. With three stalks bearing large ears, less difficulty and expense will be found in harvesting, than with more stalks producing small ears.

Hills v. Drills.—There are two general systems of arranging the seed in the row generally followed, first grouping from two to five kernels in hills some distance apart, second, drilling the seed one seed in a place, along the row closely together. The practice of drilling seed corn was the early method of planting employed by pioneer farmers. In the new countries, which were comparatively free from noxious weeds, it was not found necessary or practicable to cultivate the corn fields as carefully as is now the case in the more fully developed sections. The farmers wished to secure the largest possible yield, and so drilled their seed corn in such a manner as to secure an unusually large number of stalks in the row. As a result large yields of small ears were obtained. Upon the further development of these communities, foreign weeds were introduced and with the lessened fertility of the soil due to continuous cropping, more careful methods of cultivation became necessary. Consequently, the corn for the most part, came to be planted in hills, admitting of cross cultivation, and frequent stirring of the soil keeping the surface comparatively level. In tests of the two systems, equal number of stalks being retained in the hilled and drilled rows, there has been found to be little difference in the yield per acre.

Lister v. Planter.— In some sections, particularly in the States of Kansas and Nebraska, the seed corn is planted with listers. A lister is a plow and planter combined, which opens a furrow, drills the seed corn in this furrow, and covers the seed at the same time. It is therefore the means of planting large areas in a comparatively short time and at a small expense. From the extensive use of the lister in these regions, with apparently good results, the practice has spread to other States where it is now under trial. Experience has suggested certain modifications of the original simple plan, one of which is to plow the land early in the spring, and when ready to plant, use the lister instead of the ordinary methods of preparation of the seed bed and planter. Another method is to open up furrows through the fields with the lister, very early in the spring, without planting, then later list again, opening new furrows between the first ones in which the seed is drilled. It has been found that in these older districts this method is not as successful as the plowing of the land and thorough preparation of the seed bed. It corresponds to planting the seed in a dead furrow. Where it is necessary to plant the seed deep in the ground to get moisture for germination, it is probable that this system may be valuable. On sandy soils it will probably succeed, while in the heavier clay or clay loam soils, it does not give the best results.

Root Injury During Cultivation.— The vital principle of cultivation of the growing corn plant is that the plants be allowed to grow undisturbed and without competition of other plants, with sufficient stirring of the surface soil to prevent the rapid evaporation of soil moisture. In an experiment with pruning or cutting off the roots of the corn plant at the Illinois Agricultural Experiment Station, striking results followed such injury. The experiment was laid out so that one row was root pruned, the next row not pruned to serve as a check upon the pruned row, and so on through the entire plat, the root-pruned rows being repeated a large number of times and the average result obtained. The object of this experiment was to find out whether or not root injury following deep cultivation reduced the yield of the crop. This experiment was carried on for three years, and at the end of that time the results were so uniform that the object was deemed to have been obtained, and the experiment was discontinued. The pruning was done with a broad, flat, thin, and sharp spade-like instrument, which could be used to cut off the roots without injuring or interfering with the condition of the soil about the plants. The roots were cut off about six inches from the hill or about the usual distance to which the cultivator shovels are run. Three general depths were tried, two, four, and six inches, and although in individual seasons other experiments were made upon different and more depths, the results were so similar that they were discontinued and not used in the sim-

ple and striking results cited in the following table:

EFFECT OF ROOT PRUNING ON CORN. AVERAGE OF THREE YEARS' TESTS.

(Yields in bushels per acre.)

Plants not pruned	62
Plants pruned two inches deep	60
Plants pruned four inches deep	45
Plants pruned six inches deep	30

It can be readily seen without further explanation that injury to the roots interferes in the plant's development and reduces the yield.

Depths and Systems of Cultivation.— The cultivation of the growing crop presents many problems differing according to the conditions of soil and climate. The general results of four years of tests of different methods of cultivation, indicating in a general way the effect of different systems in the corn belt, is epitomized in the following table. There was found in these experiments a close correlation between the theory of cultivation and the results obtained by following out the methods suggested by the foregoing discussion.

EFFECT OF DIFFERENT SYSTEMS OF CULTIVATION. AVERAGE OF FOUR YEARS' TESTS.

(Yield in bushels per acre.)

Method	
Weeds allowed to grow	58
Weeds cut with hoe and a loose mulch made with hoe frequent cultivation	96
Two inches deep cultivation (small shovels)	90
Four inches deep cultivation (small shovels)	91
Six inches deep cultivation (small shovels)	84
Six inches deep cultivation (large shovels)	87
Gopher or blade cultivator	88
Deep early and shallow late	85
Shallow early and deep late	89
Mulched with grass	92

The results of the above trials indicate that all competition with weeds must be prevented, from the fact that they live upon the same elements of fertility as the corn plants, and in this way reduce the yield of the corn crop. Deep cultivation injures the roots of the corn plant and reduces the yield. Shallow, frequent cultivation, removing the weeds, keeping a soil mulch on the surface of the soil, gives the best results. This conclusion agrees in general with the facts of ordinary practice in well-drained and fertile soils. In very weedy fields, undrained and in poor condition, it may be necessary to cultivate deeply in order to destroy the weeds, open the soil to the air and sunshine, and allow the excessive water to drain off.

In summing up the important facts of cultivation, the following points should be emphasized:

1. The preparation of the seed bed should be such as to best conserve soil moisture, and obtain the most favorable mechanical soil condition.

2. The cultivation of the growing crop should be such as to avoid all root injury, maintaining a loose surface soil mulch, and preventing the presence of all weeds or competing plants.

3. The method of planting and caring for the crop will depend upon local conditions to such an extent that it is necessary for every grower to make a thorough study of his peculiar conditions of soil and climate in relation to his methods of cultivation.

4. The conditions of growth for the corn crop are moisture, heat, light, and plant food. The supplying of the conditions in the most favorable manner to the corn plants is the business of the grower, and will give the largest profitable returns.

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Corn-cockle (*Agrostemma githago*), a genus of the pink family (*Caryophyllaceæ*). It is an annual pubescent often-branching herb, from one to three feet tall, distinguished by its large purple flowers. Though a native of Europe and western Asia, it is now found in almost all parts of the world, frequenting grain-fields and waste places. When its seeds become mixed with those of the grain, and are ground with them, it is said the effect is to render the grain unwholesome; thus it requires to be separated from the grain by a special kind of sieve. In Germany the seed when ripe and dried is called schwartz-kümmel (black cumin), and is sold for medicinal and domestic purposes.

Corn-crake (that is, "corn crow," because of its cry), the common name in England of a small rail (*Crex pratensis*) which frequents meadow lands throughout Europe; also called landrail. The name crake is applied to various other birds of the family *Rallidæ*, which differ from the typical rails in having a shorter beak. In the United States the common rail (*Porzana carolina*) and allied species are occasionally so called. They are secretive birds, abundant in reedy swamps, and are much sought by gunners in the fall of the year.

Corn-flower, a genus of the order *Compositæ*, having about 350 species, mostly natives of Europe. It is found wild in waste places, and in ballast from Quebec to Virginia. The plant is universally known and admired for the beauty of its wreath-like circle of outer barren florets, and the splendid deep azure of their hue. It was formerly of some medicinal repute, and its blue flowers were used in domestic dyeing. In America many varieties and shades have been developed, as it is a favorite garden plant. It is also known by the names of bachelor's button, corn-bottle, witches' bells or thimbles, corn-centaury, brushes, hurtsickle, blue-bonnets, blaver, and blue-poppy.

Corn Insect-pests. The principal enemies of corn are the boll-worm (q.v.), chinch-bug, cut-worms, and certain caterpillars which bore in the stalks. In the central and southern States, notably in Kentucky and in southern Illinois, the cotton-boll worm in certain years has attacked the corn in the ear, eating the silk and afterward devouring the terminal kernels, hiding within the husk. Whole fields have thus suffered in these States, where there are two broods of the worm, the early and also the late corn faring the worst.

Cut-worms.— These caterpillars are the most insidious pests in fields when the young corn begins to sprout. One species out of many is called the corn cut-worm. It is the young of the Clandestine moth (*Noctua clandestina*). While the fully grown caterpillar has not been described, the young are more or less distinctly marked above with pale and dark stripes, and are uniformly paler below. When first hatched they feed on the corn, descending, when half-grown, into the ground on the approach of severe frosts, and reappearing in the spring, and then beginning to grow again, attaining their full

size and pupating before the middle of July, often much earlier, so that in the New England States the moth is seen from the middle of June to the middle or end of August, during which time it lays its eggs. Remedies: before planting, the seed corn should be soaked in copperas water, and late in the autumn corn land should be plowed deeply, so as to turn up the half-grown worms, and expose them to the winter cold, and to the attacks of insect-eating birds. Cut worms may be trapped into holes made by a stake in corn-hills. Riley advised dropping between the rows of corn at nightfall bundles of fresh-cut grass or clover, etc., which had been sprinkled with the Paris-green or London-purple solution.

The spindle-worm is a caterpillar nearly an inch long, smooth and naked, with the head and last segment of the body black. It bores into the stalk before the corn spindles and makes the leaves wither. The ravages of this worm begin while the cornstalk is young and before the spindle rises much above the tuft of leaves containing it. On examination a small hole may be seen in the side of the leafy stalk, near the ground, penetrating into the soft centre of the stalk. The obvious remedy is to cut open the stalk, and on finding the worm to pull up all the infested plants. The worm turns into an owlet-moth (*Achatodes zeæ*).

The stalk-borer is a caterpillar of a pale nvid hue, with light stripes along the body; it sometimes bores into the cob of growing corn. It occurs in the central and western States in June and July, the moth (*Gortyna nitela*) flying late in August and early in September. The young worm hatches about the first of July and immediately begins to bore into the stalk, but is not noticed till the plant is destroyed. It may be detected on a close examination about the first of July, its hole being at quite a distance from the ground.

The corn-weevil (*Sphenophorus zeæ*) punctures large holes in young corn near the base of the stalk, before it has spindled, and sometimes destroys whole fields of young corn. This weevil has been destructive in Tioga County, N. Y. It pierces the young corn in numerous places, so that each blade has from one to eight holes, the size of a pin or larger; when very numerous every stalk is killed. The weevils occur about an inch under ground, hanging to the young stalks with much tenacity. This weevil (q.v.) or snout-beetle is a rather large insect, its body long, narrow, nearly cylindrical, black, with coarse gray dots or punctures; its beak is nearly a third as long as the body, curved down, the tip triangular.

The corn-maggot is the larva of a fly (*Anthomyia zeæ*) which gnaws seed corn after it is planted; the maggot is like the onion-maggot, a footless, white, cylindrical worm, the head ending in two black hooks, the jaws. This insect sometimes so abounds as to nearly ruin entire fields of corn, gnawing into the seed and causing it to rot. When fully fed and ready to transform it contracts, forming a barrel-shaped brown pupa-case within which lies the pupa or chrysalis; the fly, similar to the house-fly, but smaller, appears a week after. The seed should be soaked, before planting, in gas-tar or copperas water.

Wire-worms, the larvæ or slender hard-skinned grubs of snapping-beetles (*Elates*) often ruin to a lamentable degree the roots of corn. They are hard to eradicate, but may be caught by placing slices of potato, turnip, or apple in the beds, and examining the undersides every morning. Another insect destructive to corn is the chinch-bug (q.v.) which punctures the leaves, sucking the sap. It appears early in June, and there is a summer and winter brood, the adults hibernating in the stubble. (See WHEAT-INSECT PESTS.) Several caterpillars live at the expense of corn, among them being the larva of the *io* moth, a great green worm, with poisonous spines, also the fuzzy larva of a moth (*Arctia arge*).

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Corn-laws, regulations of the grain trade. The best means of securing a sufficient and steady supply of breadstuffs has been a subject of great diversity of opinion, and the practice of governments has varied much at different times. The theory urged by Adam Smith, and now adopted in Great Britain, is that government should do absolutely nothing in the matter, on the ground that farmers and merchants, if unchecked, will always form correct views of their own interest, and that their interest will coincide with that of the community. This theory is supported by a large view of the facts. In ancient times famines were much more frequent than they are now, because commerce was more restricted, less regular and extensive, and subject to more frequent obstructions. A free communication between different countries, by which the abundance of the one may be brought to supply the want of the other, has proved the best security against the want of necessaries, and even of comforts and luxuries.

The Athenians had laws prohibiting the exportation of corn, and requiring merchants who loaded their vessels with it in foreign ports to bring their cargoes to Athens. The public provision and distribution of corn was an important branch of administration at Rome, and very intimately connected with the public tranquillity. The regulation of the supply of corn and the trade in the article have been a fruitful subject of legislation in modern Europe. But it is to be observed that the public solicitude and current of legislation take this direction only in populous countries, or at least those in which the population presses hard upon the means of domestic production of bread-stuffs; for a country of which, like Poland, the staple export is corn, needs to take no measures for securing a supply. In agricultural countries the object of solicitude is to supply the want of arts and manufactures, as in populous and highly improved countries it is to supply the want of food.

But the laws directed to this object have been very various, and some of them contradictory; for as in Athens so in England, at one period the laws prohibited the exportation of corn; whereas at another period, and for a very long one in the latter country, a bounty was given on the exportation; and both these laws had the same object, namely, the adequate and steady supply of the article.

Corn-salad, called also lamb's lettuce, a genus of the valerian family (*Valerianaceæ*). There are about 50 species natives of the northern hemisphere, most abundant in the Mediterranean region. Between 10 and 15 species occur in the western parts of the United States, some

of which are natives. The plant is an humble annual weed, which is used as a spring salad, especially in France and Germany. The commonest species is *V. olitoria*, which is naturalized in the United States, and often called fetticus, white pot-herb, and milk-grass. It is found in waste places and moist ground from April to July. Corn-salad is cultivated in much the same way as spinach, and is much used for the same purpose as ergot (q.v.).

Corn-smut, a parasitic fungus (*Ustilago maydis*), affecting the corn. As an agricultural scourge corn smut has an unsavory reputation. In medicine it has been used for much the same purpose as ergot (q.v.).

Corn-snake (*Calopeltis*, or *Coluber, guttatus*), a snake of the family *Colubridæ* (q.v.), common in the southern United States. It reaches a length of four feet, and is reddish brown above, with a series of dark-bordered red blotches, and only a few of the most dorsal rows of scales keeled.

The southern variety of the house snake is also known under the name of corn-snake. It is readily distinguished by the entire anal plate, which is in two pieces in *Calopeltis*, the complete absence of keeled scales, and the series of confluent black and yellow rings on each side.

Cornaceæ, kôr-nā'sē-ē, the dogwood family, a natural order of plants containing about 16 genera and 85 species, chiefly natives of the north temperate zone. Some species produce edible fruits; some are valuable for the medicinal virtues of their bark, and others are cultivated as ornamental plants. See DOGWOOD; TUPELO.

Cornaro, Ludovico, loo-dō-vē'kō kōr-nä'-rō, Venetian nobleman: b. 1467; d. Padua 1566. From the 25th to the 40th year of his age he was afflicted with a disordered stomach, with the gout, and with slow fevers, till at length he gave up the use of medicine and accustomed himself to extreme frugality in his diet. The beneficial effects of this he relates in his book entitled, 'Discorsi della vita Sobria' ('The Advantages of a Temperate Life') (1558, the English translation of which has passed through over 30 editions). Cornaro's precepts are not applicable in their full extent to every constitution; but his general rules will always be correct. His diseases vanished and gave place to a vigorous health and tranquillity of spirits, to which he had hitherto been an entire stranger. He wrote three additional treatises on the same subject. In his work upon the 'Birth and Death of Man,' composed a few years before his death, he says of himself, "I am now as healthy as any person of 25 years of age. I write daily seven or eight hours, and the rest of the time I occupy in walking, conversing, and occasionally in attending concerts. I am happy and relish everything that I eat. My imagination is lively, my memory tenacious; my judgment good; and what is most remarkable in a person of my advanced age, my voice is strong and harmonious."

Corn'bury, Edward Hyde, LORD, 3d Earl of Clarendon, English colonial governor: d. London 1 April 1723. He was the son of the 2d earl of Clarendon, and one of the first officers of his household troops to desert from the service of King James II. to the Prince of Orange in 1688. In return, he was made governor of New York, where he arrived 3 May 1702. He was in debt, and was rapacious and bigoted to such a degree as to have left the memory of the worst governor ever appointed to the colony. Great complaints being made, he was removed from his office in 1708.

Corncracker State, a nickname of Kentucky, whose people are often called "Corncrackers."

Cor'nea (Lat. "horny," "hornlike"), the transparent concavo-convex disk which forms the anterior 5th of the globe of the eye, fitted accurately into the sclerotic or fibrous coat forming the posterior four fifths of the organ. It is a segment of a smaller sphere than the sclerotic, and is from seven to seven and a half lines in diameter; the greatest diameter being the transverse. Its anterior convex surface is covered by a continuation of the conjunctival epithelium, and its posterior concave surface is lined also with delicate epithelium pavement, which is in contact with the aqueous humor, and supposed by some to be concerned in the secretion of this fluid. The degree of convexity varies, being usually greatest in children and near-sighted persons. Its circumference is described as fitting into the sclerotic like a watch crystal into its frame. Its principal thickness, which is nearly the same at all points, is made up of six to eight layers of soft indistinct fibres, continuous with and similar to those of the sclerotic, connected together by delicate areolar tissue; these may be separated by maceration. Behind the cornea proper is an elastic transparent lamina called the membrance of Demours. Though no vessels have been traced into the cornea, their existence is indicated by the occurrence of inflammation, ulceration, and adhesion. A superficial and a deep series of vessels surround the cornea, anastomosing freely around its margin; the superficial vessels are continuous with those of the conjunctiva, and the deep with the short ciliary arteries. In diseased conditions, both sets of vessels may be prolonged into its substance. No nerves have been traced into the cornea. Its diseases are many, frequent, and dangerous to vision; from its exposed situation, it is liable to suffer from blows, cuts, and the introduction of foreign substances. It is often inflamed in various ophthalmic diseases, resulting in opacity, ulceration, increased vascularity, softening, and rupture from gangrene; these affections are tedious and difficult to cure, are often painful, and generally leave the patient with more or less obstruction of the power of vision. In old persons, the circumference of the cornea often presents a whitish zone, a line or two wide, the result of physiological causes, and not interfering with vision. The convexity of the cornea in aquatic and amphibious animals is slight, and sometimes almost lacking.

Corneille, Pierre, pē-ār kōr-nā-yė, French dramatist: b. Rouen 6 June 1606; d. Paris 1 Oct. 1684. He began his dramatic career with comedy. His first piece was 'Mélite,' played in 1620. It was followed from 1632 to 1636 by 'Clitandre'; 'La Veuve'; 'La Galerie du Palais'; 'La Suivante'; 'La Place Royale'; 'L'Illusion Comique,' which had great success. Being more natural and more vigorous in style than the dramas which then held the stage, they announced the approach of a reformer endowed with talents of a higher order, and as such he

was recognized even by his rivals. His 'Medea,' produced in 1635, and imitated from Seneca, was the first indication of his talent for tragedy. His next work was 'Le Cid,' which raised his fame at one bound to its highest pinnacle. It has been translated into numerous languages, but scarcely bears out its reputation. The popularity of the play was unbounded. But its enemies were stimulated by the hatred of Cardinal Richelieu for its author. Corneille had been appointed as one of five authors to whom Richelieu intrusted the writing out of plays from plots furnished by himself, but he had been guilty of condemning the plot of a comedy committed to him, and the offense was unpardonable. Richelieu stimulated Chapelain to write a critique on behalf of the Academy. The critique was moderate, and while condemning the plot, admitted freely the merits of the author. It is printed in some editions of Corneille's works under the title, 'Sentiments de l'Academie Française sur la Tragi-Comédie du Cid.'

Among other accusations brought against Corneille was want of originality. This led to his selecting as his next subject Horace (not the poet, but the Horatius of early Roman history), which is perhaps the work in which he shows the greatest invention, and is one of the most admired of his productions. It appeared in 1639; the same year appeared 'Cinna,' which, according to Voltaire, was the *chef-d'œuvre* of Corneille; and in 1640 the 'Polyeucte,' which other critics have styled the most original, the most touching, and the most sublime work of the author, the *chef-d'œuvre* at once of Christian tragedy and of the French theatre. There is one flaw in this work which its admirers do not seem to have noticed. The poet so far mistakes the spirit of the Christian religion as to make Polyeucte, a convert under the Roman empire, bring martyrdom upon himself by rushing in to interrupt the Pagan sacrifices, and overthrow the altar on which the priest is sacrificing. 'Pompée,' an inferior piece, appeared in 1641, and in 1642 'Le Menteur,' the greatest of Corneille's comedies, imitated, like the 'Cid,' from the Spanish. Foote has produced an English version of it called 'The Liar.'

From this time the success of Corneille as a dramatist steadily declined and many of his numerous works, in spite of the fame of their author, never acquired celebrity. On the merits of others the utmost diversity of opinion has prevailed, the same work being the subject of extravagant eulogy and unqualified condemnation. 'Rodogune,' 'Heraculius,' 'Don Sanche,' and 'Nicomède' are among the best works of his second period, 1646–52. 'Rodogune' was his own favorite production. Some critics speak highly of it; others condemn it as showing marked indications of decline. From 1653–9 he gave up writing for the stage, and employed himself with preparing a poetical translation of the 'De Imitatione Christi.' In the latter year he was induced to return to the drama, and persevered for 15 years amid declining success to produce pieces generally inferior to his earlier works. 'Œdipe' (1659) and 'Sertorius' (1662) are the best works of this period. 'Tite et Bérénice' (1670) was a rival production to the 'Bérénice' of Racine, the subject being prescribed to both poets by the Princess Henriette; but Racine's poem was a success, that of Corneille a failure. His last pieces, 'Pulchérie' (1672), 'Suréna' (1674), were the weakest as well as the last. He had been chosen a member of the Academie Française in 1647, and was dean of the Academie when he died in 1684. Besides his dramas he wrote some minor poetry, elegies, sonnets, epistles, etc., under the title of 'Poésies Diverses,' and also in prose three discourses, 'Sur le Poeme Dramatique'; 'Sur la Tragédie'; and 'Sur les trois Unités.' Voltaire has remarked that Corneille was the first dramatist who made the sentiment of admiration the basis of tragedy instead of terror or pity.

The admirers of Corneille gave him the strongest praise for the quality sublimity. This is a quality not easily defined, and in straining after it it is only too easy to fall into faults very much opposed to sublimity. The faults found with Corneille in his weaker productions are precisely such as might be produced by such an effort, declamation, inflation, abuses of sentences, and great words. His versification is less accurate and polished than that of Racine, as when he began to write the language was less formed, and his own taste in this respect probably less fastidious. There may also be observed in Corneille's delineation of character a straining after a heroic ideal, rather than a true and profound analysis of the real springs of human sentiment and emotion, in which alone an inexhaustible fund of dramatic action is to be found. He was, like Racine, strongly impressed with religious convictions, and extremely scrupulous in his writings. He had a high idea of his own powers, but was deficient in social tact, and in conversational ability to such an extent that it is said he did not always express himself grammatically. When reproached for his carelessness in cultivating the graces of society, he would reply, "Je suis toujours Pierre Corneille."

Corneille, Thomas, tō-mä, French dramatist, brother of the preceding: b. Rouen, 20 Aug. 1625; d. Andelys, 8 Dec. 1709. He lived in the most friendly union with his brother till the death of the latter. They had married two sisters, lived in the same house without any division of means, and were remarkable for the conformity of their tastes. His first comedy, 'Les Engagements du Hasard,' appeared in 1647, and was successful. The number of his dramatic works is 42; yet most of them are now little known. His comedies, however, at the time of their appearance, were received with greater interest, if possible, than those of the great Corneille, in imitation of whom Thomas applied himself to tragedy; and his 'Timocrate' (1656) was received with such continual applause that the actors, weary of repeating it, entreated the audience, from the stage, to permit the representation of something else, otherwise they should forget all their other pieces. Since that time it has not been brought upon the boards at all. 'Camma,' in 1661, produced an equal sensation. The spectators thronged in such numbers to witness the representation that scarcely room enough was left for the performers. His best tragedy is 'Ariane' (1672). 'Le Comte d'Essex' (1678) has also retained some celebrity, although marred by the ignorance it displays of English manners and history. 'L'Inconnu,' a heroic comedy, appeared in 1675. In 1677 he versified 'Le Festin de Pierre' at the request of the widow of Molière, and until recently, when the prose of

Molière superseded it, it was always represented in his version. He was a dramatist of the second rank, laborious but wanting in originality, yet not without considerable resources. In 1685 he succeeded his brother in the French Academy by a unanimous vote.

Cor'nel, (L. *cornu*, horn, from the hard horn-like wood), a shrub belonging to the genus *Cornus*, about 20 distinct species, native of north latitude, temperate climate. Flowers generally small, four parted, ovary inferior, and two- or three-celled; fruit fleshy, and edible in some species, especially those in Europe. The cornelian cherry (*Cornus mas*), of Europe, bears small greenish flowers; the fruit is acid and edible. The dogwood of the eastern part of the United States is the *Cornus florida*, a small tree which in May and June is covered with large white or pale pink flowers; the wood of which has a fine fibre and is very hard. The bark is sometimes used as a tonic. *C. canadensis*, bunchberry, of woods in the northern part of the United States, is a low herb which bears a close cluster of flowers that ripen into red, fleshy, edible berries. In North America there are about 18 well-known species. See Dogwood.

Cornelia, Roman matron, the daughter of Scipio Africanus the elder. She married Tiberius Sempronius Gracchus, censor 169 B.C., by whom she was the mother of the two tribunes, Tiberius and Caius. Left a widow with a young family of 12 children, she devoted herself entirely to their education. Only three of her family survived their childhood, her daughter, married to Scipio Africanus the younger, and her two sons. Cornelia was highly educated, and united the severe virtues of the old Roman matron with the refinement which then began to prevail in the upper class society of Rome. She bore the death of her sons with magnanimity, and afterward retired to Misenum, where she spent the remainder of her life. She exercised unbounded hospitality, and was constantly surrounded by men of letters. The Roman people erected a statue to her with the inscription: "Cornelia, Mother of the Gracchi."

Cornelian, kôr-nēl'yan, or **Carnelian** (Fr. *cornaline*, from Lat. *corna*, "horn"), a precious stone varying from a light and fleshy red, opaque, and semi-transparent, with and without veins, to a brilliant transparency and color approaching the ruby, from which they are, however, known by sure distinctive marks. It consists of silica along with minute quantities of the oxides of iron, aluminum, and sometimes of other metals, and is actually a variety of chalcedony. It is much used for seals, bracelets, necklaces, and other articles of minute gem sculpture; appended to watches, ornaments now in little use. It was known to the Romans, as we learn from Pliny, by the name of *sarda*, from being found originally in Sardinia. The number of the cornelians that were engraved by the ancients, and have reached our times, is very considerable, and nearly equal to that of all the other kinds of gems with which we are acquainted. Pliny thinks they were clarified by being steeped in the honey of Corsica. The national collection at Paris, and the British Museum of London, have many beautiful engraved cornelians. Many of the latter were found in the field of Cannæ in Apulia, where Hannibal defeated the Romans.

Cornelis, kôr-nā'lĭs, **Cornelius,** Dutch painter: b. Haarlem 1562; d. 1638. He studied with Peter Ærtsens the younger, and afterward worked at Antwerp under Peter Porbus and Giles Coignet. In 1583 he returned to Haarlem, where his great painting — the 'Company of Arquebusiers' — established his reputation. Descamps called it a collection of figures sketched by the Genius of History. In 1595, with Charles van Mander, he instituted an academy for painting at Haarlem. His numerous pictures are rarely to be bought, on account of the great value which the Flemings set upon them. Cornelis painted great and small pieces, historical subjects, portraits, flowers, and especially subjects from ancient mythology. His drawing is admirable. He is a true imitator of nature, and his coloring is always lively and agreeable. The galleries at Vienna and Dresden contain some of his pieces. J. Mueller, H. Golzius, Saenredam, L. Killian, Matham, Van Geyn, and many others have imitated his manner.

Cornelius, Peter Von, pā'tĕr fŏn kôr-nā'lē-oos, German painter: b. Düsseldorf 23 Sept. 1787; d. 7 March 1867. He early exhibited a taste for art, and accustomed himself to copy from memory the works of Raphael and other masters. He thus acquired an early proficiency, and at 19 was entrusted with the painting of the cupola of the Church of Neuss, near Düsseldorf. It was executed in chiaroscuro, in figures of colossal size, and showed already the grandeur of conception by which he was afterward distinguished. He soon after removed to Frankfort, where in 1810 he commenced a series of designs illustrative of Gœthe's 'Faust.' In 1811 he went to Rome, where, with Overbeck, Veit, and other associates, he projected the formation of a new school of German art, and especially the revival of fresco painting, in imitation of Michael Angelo and Raphael. Bartholdy, the Prussian consul-general, commissioned some members of this school to paint his villa. Cornelius executed two frescoes for this purpose — 'Joseph Interpreting the Chief Butler's Dream,' and 'Joseph Recognizing His Brethren.' He afterward began a series of frescoes from the 'Divina Commedia' for the Marquis Massini, but left it unfinished in consequence of receiving a commission to execute the frescoes in the Glyptothek, then newly erected at Munich. The designs for the villa of Massini, though never painted, were engraved by Schoefer, and another series, illustrative of the 'Niebelungen Lied,' were engraved by Amsler and Lips.

Before leaving Rome (1819) Cornelius had been appointed director of the Academy at Düsseldorf. His first work was to reorganize the Academy, and then to give his whole attention to the painting of the Glyptothek, which demanded a constant residence at Munich. He resigned the directorship after a short time, and received in 1825 that of the Academy of Munich. Simultaneously with the Glyptothek he undertook the painting with frescoes of the Ludwigs-Kirche. In these two great works he was assisted by his Munich pupils. Many of the cartoons prepared by him were painted under his superintendence by Zimmermann, Schotthauer, and others. In the Glyptothek two large halls were entrusted to him to decorate. In the one, called the Hall of Heroes, he gave a repre-

sentation on a colossal scale of the leading events of the Iliad; in the other, named the Hall of the Gods, he symbolized the Grecian mythology. In the Ludwigs-Kirche the greatest painting in size and importance was the 'Last Judgment,' of which one critic says that it is without a rival among contemporary paintings, another that it is enough to say of it that in it Michael Angelo is both imitated and disregarded. Cornelius also painted at Munich the Pinakothek, a picture gallery for which, with the assistance of his pupils, he executed an extensive series of frescoes representing the history of painting. In 1841 he was invited to Berlin by Frederick William IV., who entrusted him with the painting of the royal mausoleum or Campo Santo. The most celebrated cartoon in this series is the 'Four Riders of the Apocalypse.' The series consists of 12 paintings, which have been engraved. He was admitted a foreign member of the Institute of France in 1838, and a member of the Academy of Berlin in 1841. His advice and assistance were widely sought, and he executed or superintended various works besides those enumerated.

On his merits as an artist there are the widest diversities of opinion according to the sympathies of those by whom he is appreciated. Cornelius was a true representative of modern German thought in its highest phases. He introduced into art a metaphysical and subjective element which in the hands of so competent an interpreter could not but be productive of great results, but which is equally open to the severest criticism. That he was the founder of a school and threw new life into German art the mere enumeration of his great undertakings is sufficient to prove. Even his admirers, however, admit certain faults in his execution, and it would seem that in aiming at grandeur he too often failed to be natural. In seeking to develop his leading idea he subordinates details to an extent which amounts to sacrificing them, and that idea is often admittedly recondite, and requires learning and study to appreciate it. Still his admirers insist that his merits are such in the grandeur and beauty of his designs and the elevation of the tone of his execution as to overbear all faults of detail; but there are not wanting detractors who say that his excellences, whatever they may be, do not belong to the region of art, and that it is necessary to go outside of it into that of metaphysics to be able to appreciate them. Consult Grimm, 'Neun Essais' (1865); Von Wolzogen, 'Peter von Cornelius' (1867); Riegel, 'Cornelius, der Meister der deutschen Malerei' (1870); Förster, 'Peter von Cornelius: ein Gedenkenbuch' (1874); Muther, 'History of Modern Painting,' Vol. I. (1895).

Cornelius, Peter, German musician and writer: b. Mayence, 24 Dec. 1824; d. there, 26 Oct 1874. He was first an actor, but became a follower of Wagner and wrote: 'The Barber of Bagdad,' 'The Cid,' and other successful operas. He also brought out a volume of 'Lyric Poems.'

Cornelius Nepos. See NEPOS.

Cornell', Alonzo Barton, American capitalist and politician: b. Ithaca, N.Y., 22 Jan. 1832; d. 15 Oct. 1904. He is a son of Ezra Cornell (q.v.), and his early life was spent as a telegraph operator and manager in Cleveland, New York, etc. He was defeated as Republican candidate for lieutenant governor in 1868; was chairman of the New York State Republican committee 1870–8; surveyor of customs, New York, 1869–73; speaker of the assembly 1873; and naval officer of the port of New York 1876–8. During Cornell's occupancy of the latter office, President Hayes issued his famous order requiring office holders to refrain from politics. In spite of this warning, Mr. Cornell, as chairman of the State committee, called the Rochester convention to order, and as a consequence lost his office, July 1878. In 1879 he was elected governor by the Republicans, and served until 1 Jan. 1883, since which time he has devoted himself to the care of his large financial interests. He wrote: 'True and Firm: Biography of Ezra Cornell, Founder of the Cornell University: a Filial Tribute' (1884).

Cornell, Ezra, American philanthropist: b. Westchester Landing, N. Y., 11 Jan. 1807; d. Ithaca, N. Y., 9 Dec. 1874. His early education was scanty, and he began life as a mechanic and miller at Ithaca, N Y. In 1842, when telegraph lines were first being put in operation, his suggestion that the wires should be strung on poles was adopted. He then devoted himself to telegraph line construction and the organization of telegraph companies, and accumulated a large fortune. He was a member of the State assembly in 1862–3 and of the State senate in 1864–7, but is best known as the founder of Cornell University (q.v.).

Cornell, John Henry, American musician: b. New York 8 May 1828; d. there 1 March 1894. He studied music in Germany and England; was organist of St. Paul's Church, New York, 1868–77, and of the Brick Presbyterian Church 1877–83, his latter years being given up to composing, adapting, and editing. His publications include: 'Primer of Modern Musical Tonality' (1876); 'Easy Method of Modulation'; 'Manual of Roman Chants'; 'The Congregational Tone Book'; 'Practice of Sight Singing'; a translation of Bussler's 'Theory and Practice of Musical Form'; and of Ambros' 'The Boundary of Music and Poetry,' both from the German.

Cornell College, a coeducational institution in Mount Vernon, Iowa; organized as a college in 1857, under the auspices of the Methodist Episcopal Church. Number of professors and instructors, 34; students, 647; volumes in the library, 22,300. Its endowments are over $300,000, and its income is nearly $45,000.

Cornell University, at Ithaca, N. Y., owes its origin primarily to the Land Grant Act of 1862, "donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts." Under this act New York received as its portion 989,920 acres of land. The institution established was named in honor of Ezra Cornell (q.v.), who offered to give $500,000 with which to erect its buildings (the terms of the land grant forbidding the use of its proceeds for that particular purpose), on condition that it should be located at Ithaca. The university was incorporated in 1865. The number of students (412) who registered at the opening was highly satisfactory. The liberality of the charter, which guarded against possible control or undue influence by any religious



1. Boardman Hall.

2. Library Building.

denomination; the nature of the entrance requirements; the promise of opportunities to pursue lines of study not found in other schools then existing; the location, free from the distractions of a large city — these and other features combined to attract students to the new school. Yet, encouraging as was the beginning the university for the next four years had much difficulty in maintaining its existence. The State's land scrip, which was expected to bring not less than $10 an acre, was being sold for only 50 cents an acre, when Ezra Cornell, believing that the land would increase in value, purchased all the scrip, which had not been otherwise disposed of, and bought over 500,000 acres of excellent timber lands in Wisconsin, which before his death he transferred with full title and control, to the university. But not before 1882 were any of these lands sold for amounts sufficient materially to aid the institution; then the sum of $2,320,000 was realized from the sale of 140,000 acres. Later other lands were sold at fair prices, making in all from the land grant lands a net profit of about $6,000,000.

Besides Ezra Cornell's endowment, the university received large gifts from Henry W. Sage, for a women's dormitory, a chapel, a library building and a book endowment fund, a school of philosophy, a museum of archæology, etc., all generously endowed; a donation from John McGraw for a building devoted to museums and scientific laboratories; from Hiram Sibley for a college of mechanical engineering and mechanic arts; from Andrew D. White a priceless historical library; from Dean Sage a fund for supplying the college pulpit, etc. The university is also indebted to A. S. Barnes for a Christian Association building; to William H. Sage for the chapel enlargement and organ, the purchase of the great Zarncke library, a stone bridge, and in conjunction with Dean Sage, an endowed infirmary for sick students; to Dean Sage for Stimson Hall; to John D. Rockefeller for Rockefeller Hall of Physics; to Willard Fiske for a library fund of about a half million dollars; to Oliver H. Payne for the Cornell Medical College in New York city, and to others for valuable gifts. The total property valuation of Cornell University in 1904 was $12,618,165.49. The total invested funds were $7,649,109.61; total income for 1904, $1,116,459.09, of which $248,975.71 represented tuition fees. Grounds, buildings, equipment, and other property used by the university were estimated at $4,597,370.84. The library comprised 286,405 volumes and 46,500 pamphlets. The average annual growth of the library has been about 13,000 volumes, though it will be much increased by the recent endowment. In all 7,714 degrees had been granted, and there were about 7,000 living graduates.

The broad scope and many-sidedness of the university are based on Ezra Cornell's proposition, "I would found an institution where any person can find instruction in any subject," in which the more specific purpose of the national donors was absorbed and included. Since provision was made for women in the early 70's they have formed from 10 to 15 per cent of the student body, though in recent years the number both absolutely and relatively has decreased. The university annually grants free tuition to 600 students of New York State, apportioned by assembly districts; also to students in agriculture, and to New York State students in veterinary medicine.

Cornell University occupies in the United States a middle ground between the institutions of private or chiefly private foundations, with independent corporate existence, and the State universities supported and controlled by the States. The government of the State of New York is represented in Cornell University by ex officio members on the board of trustees. Its constitution has undergone many changes, as well of internal arrangement as of outward expansion. Its present organization is as follows: 1. Graduate department. 2. College of Arts and Sciences. 3. College of Law. 4. College of Medicine. 5. New York State Veterinary College. 6. College of Agriculture. 7. College of Architecture. 8. College of Civil Engineering. 9. Sibley College of Mechanical Engineering and Mechanic Arts.

The graduate department has charge of the graduate studies of the other departments. Courses leading to the degrees of A.M. and Ph.D. are pursued in this department; and 17 graduate scholarships of the value of $300 each, 22 fellowships of $500 each, and 2 of $600 each are annually granted to graduate students, beside one traveling fellowship in architecture of the annual value of $1,000, good for two years. The College of Arts and Sciences allows elective courses in science and the classics and leads to the A.B. degree. The College of Law has the usual law courses and grants the degree of LL.B. The College of Civil Engineering provides instruction in all departments of that subject, and particularly in some of the more advanced developments of the science. Special instruction is given in bridge engineering, railroad engineering, sanitary, municipal, hydraulic, and geodetic engineering. Numerous graduate courses are provided, for illustrating which an astronomical observatory or laboratory, a magnetic laboratory and other laboratories furnish ample means. The museums of the College of Civil Engineering are rich in collections of models, instruments of precision, base-line, and gravity apparatus, together with a large assortment of the usual field instruments, such as transits, theodolites, levels, etc.

The Sibley College includes eight departments: mechanical engineering, experimental engineering, electrical engineering, machine design, mechanic arts or shop-work, marine engineering, naval architecture, and railway mechanical engineering. Courses of study are four years in length, and the degree of mechanical engineer is conferred upon those who successfully complete the respective courses. The laboratories, museums, shops, and other parts of the college are very completely furnished and equipped. Hiram Sibley continued making additions to his first donations, and in 1885 the trustees of the university organized the college under the name by which it is now known. Mr. Sibley's gifts amounted to $160,000, and $150,000 additional have been contributed by his son, Hiram W. Sibley. The College of Architecture gives the usual course in this subject, both in theory and practice, and confers the degree of B.Arch.

The College of Agriculture gives extended and practical courses. An experiment station established by the Federal government is connected with this department. In 1904 the New York State legislature established a State College of Agriculture at Cornell, and appropriated $250,000 for buildings therefor. The College of Medicine (established in 1898) has a two years' course in Ithaca, and a full four-year course in New York.

The entrance requirements to all courses have been raised and are now substantially the same as those of other first-class universities. In 1904 the total number of students in attendance was 3,317, and of this number the College of Arts and Sciences had 684 and Sibley College 1,000. There were 465 members of the faculty, some of whom were engaged in university extension work. The summer school has always had a large attendance. See SUMMER SCHOOLS.

The campus is admired for its beauty and extent, and the group of buildings which belong to the university are models of architecture. The library, with its famous Fisk Dante collection and the Andrew D. White French Revolution collection; the laboratories, halls, and dormitories; the class rooms, and other features of the university all present special advantages and attractions.

Revised by DAVID F. HOY,
Registrar.

Corner, a commercial term used in England and the United States to signify the control of so large a supply of an industrial or commercial product or of so much of a stock that the market value of the commodity held is tremendously advanced, and those who have made contracts to deliver the stock or commodity in question must buy at the prices set by the pool. So the actual difference between the manœuvre of the corner-man and the normal effort to bull prices by controlling supply is that the corner is based upon knowledge of contracts made for future delivery by those who are not in present possession of the stock. Successful corners depend then not only on a thorough understanding of where the control of the commodity in question lies, lest another holder at the critical moment be able to undersell the would-be corner-man, but on the willingness of the buyer to keep his contracts at no matter what cost. In other words, if the corner-man is too greedy and demands too high a price, buyers may smash the corner by refusing to keep their contracts, a procedure with a certain amount of poetic justice in it, at least when the members of the corner have gained control of the supply which they are to rebuy from the contractors. Cereals and cotton, because of the large amount of future trading done in them, are favorite fields for the corner-man; but the exact amount of a year's crop and the thorough location of such holdings make the manœuvre particularly dangerous. Many of the worst financial panics in the United States have been the results of attempts, usually unsuccessful, to corner the gold market.

Cor'net (Fr. "little horn"), formerly a reed wind instrument of the oboe class; but the name cornet or *cornet-à-pistons* is now given to a brass musical instrument with a cup-shaped mouthpiece, which has a very agreeable tone, and is much used in orchestras and military bands, and sometimes with organ in church music. The cornet is intermediate in character between the French horn, the trumpet, and the bugle. Its characteristic feature is its three pistons, which may be pressed down by the fingers singly or together, so as greatly to increase its compass. The first lowers the pitch by a tone, the second by a semitone, the third by three semitones. From its military use the term cornet was transferred to a cavalry troop, because it was accompanied by a cornet player, and then to the color officer of this troop, the cornet of cavalry corresponding to the infantry ensign. This title of the English army was abolished in 1871, the rank of sub-lieutenant taking its place.

Corneto, kōr-nā'tō, or **Corneto Tarquinia**, Italy, a picturesque, mediæval-looking town, situated 12 miles north of Civita Vecchia, 3 miles from the Mediterranean, on the Marta River. Corneto is the seat of an episcopal see. It rose out of the ruins of the Etruscan city of Tarquinii, whose remains, within a mile and a half of Corneto, are among the most important for the student of Etruscan history. The painted tombs, of which some 20 are specially interesting, were known in the 18th century; but it is mainly since 1842 that they have been examined; valuable new discoveries were made during excavations in 1881–2. Pop. about 7,000.

Corn'hill, London, one of the principal streets of the city, once a corn market. In mediæval times two of its attractions were the Tun, a round house used as a temporary prison, and the Standard, a water conduit and also a point of measurement.

Cornice (It. "cornice"), **La Corniche**, or **Cornice Road**, a famous highway between France and Italy, skirting the Mediterranean from Nice to Genoa. The word cornice means literally "shelf," in allusion to the fact that for miles the road is cut in the face of the cliffs. The modern road was begun by the French, and finished by the Sardinian government after the fall of Napoleon.

Cornice, in classical architecture, the uppermost of the three parts of an entablature, composed of the projected moldings of the roof. (See ARCHITECTURE, Plate I.) The Doric cornice consists of a Doric cyma, the corona projecting considerably, and containing the ends of the roofing boards, a second cyma, and an ereet bell molding. The Ionic cornice shows a fillet either with dentals or quite plain, above which are a wave molding and the corona, terminating in a slab and erect bell molding. The Corinthian cornice differs from the Ionic in having small consols, composed of volutes and acanthus leaves. In Gothic architecture the cornices are often elaborately adorned with animals or with human figures.

Corning, Erastus, American capitalist: b. Norwich, Conn., 14 Dec. 1794; d. Albany, N. Y., 9 April 1872. He became a prominent iron merchant in Albany, N. Y., subsequently engaged in the banking business, and applied much of his time and means to the development of the railroad system of New York State. He effected the consolidation of various roads into the New York Central R.R., and was its president 12 years; was State senator 1842–5; member of Congress 1857–9 and 1861–3; member of the

Peace Congress in 1861, regent of the University of New York in 1833, and vice-chancellor of the board.

Corning, James Leonard, American physician: b. Stamford, Conn., 28 Aug. 1855. He studied at the universities of Heidelberg and Würzburg in Germany, graduating at the latter. He has an international reputation as an expert neurologist, and as the discoverer of spinal anæsthesia (1885). He has contributed a large number of articles on his specialties to the medical press, and among his publications are: 'Brain Rest' (1883); 'Local Anæsthesia' (1886); 'Hysteria and Epilepsy' (1888); 'Treatise on Headache and Neuralgia' (1888); 'Pain in Its Neuro-Pathological and Neuro-Therapeutic Relations' (1894); 'Experimental Researches Regarding the State of the Mind in Vertigo' (1895). Under the pseudonym of Roland Champion he wrote a romance entitled 'Princess Ahmedee' (1900).

Cor'ning, N. Y., a city, county-seat of Steuben County. It is situated on Chemung River, the Erie, and the Delaware, Lackawanna & Western railroads; it is widely known for its extensive foundries, glass factories, railroad car works, and the coal mines in its vicinity. Pop. 11,061.

Cor'nish, Charles John, English naturalist: b. Salcombe House, Devonshire, 28 Sept. 1859. He was educated at the Charterhouse and Hertford College, Oxford, and has for many years been a frequent contributor to 'The Spectator' on natural history and out-door life. His published books include: 'The New Forest' (1894); 'The Isle of Wight' (1895); 'Life at the Zoo' (1895); 'Wild England of To-day' (1896); 'Animals at Work and Play' (1896); 'Nights with an Old Gunner' (1897); 'Animals of To-day' (1899); 'The Naturalist on the Thames' (1902).

Cornish Engine, a single-acting steam-engine used for pumping water. The pump-rods are loaded so as to have sufficient force by their gravity to raise the water, and the down-stroke of the steam piston at the other end of the beam is used to raise them. The name comes from the engine's use in the copper and tin mines of Cornwall.

Cornish Language, a Celtic dialect spoken in Cornwall, which died out in the 18th century, though isolated words or terms are still in use, and some fragments of literature are still extant. It is allied to the Welsh and Breton. See Celtic Languages and Celts.

Cornstalk, chief of the Shawnee Indians: b. about 1720; d. 1777. He was a man of high abilities and dignity of character. He first appears as heading the Greenbriar (q.v.) massacre of July 1763, in Pontiac's war; next in a far higher role, as commanding the Indian forces at the bloody and hard-fought battle of Point Pleasant, 10 Oct. 1774, in Dunmore's war (see Colonial Wars). He had opposed the war, being convinced that it meant ultimately swifter ruin for the Indians; but once embarked, he fought with a skill and resolution that excited the admiration of his enemies. After the defeat he was in favor of carrying on the war to the end; but finding his head men and sub-chiefs determined on giving up, he went himself to make the best terms he could. His oratory was said by the Virginians to equal Patrick Henry's. His death was a shame to the slayers. Early in 1777 he came with his son and two other Indians to the garrison at Point Pleasant, to tell them that, although he wished to keep the peace, his tribe was resolved on war, and if so, he must join them. The party were held as hostages; but one of a company of rangers being killed by Indians near by, the rest and their captain rushed to the fort and butchered the four, Cornstalk rising to meet his fate without a word.

Cornus. See Cornel; Dogwood; Tupelo.

Corn'wall, Duke of, a hereditary title of the eldest son of the sovereign of Great Britain. Cornwall is a royal duchy, the revenues of which belong to the Prince of Wales for the time being. The title of Prince of Wales is conferred by special creation, that of Duke of Cornwall descends by inheritance. The dukedom of Cornwall was created for the Black Prince in 1337.

Cornwall, Barry. See Procter, Bryan Wallor.

Cornwall, Henry Bedinger, American chemist: b. Southport, Conn., 29 July 1844. He graduated at Columbia 1864, and from its school of mines 1867, becoming assistant in the latter 1865–73, save for two years' study at the mining school in Freiburg, Germany. In 1873 he was appointed professor of applied chemistry and mineralogy at Princeton University, a position he still holds (1903). With Caswell, he translated Plattner's 'Manual of Qualitative and Quantitative Analysis with the Blow-pipe' (1875), and has written: 'Manual of Blow-pipe Analysis, with a System of Determinative Mineralogy' (1882), and many scientific papers that have appeared in the special journals of his profession.

Cornwall, Canada, port of entry, and capital of the three united counties of Stormont, Dundas and Glengary in Ontario, and is situated at the intersection of the main line of the Grand Trunk Railway with the Ottawa and New York Railway. It has admirable shipping facilities, and is 68 miles from Montreal, 56 miles from Ottawa, and 50 miles from the Adirondacks. Cornwall has been known for years as a factory town on account of its large textile industries. It has 8 churches, Anglican, Roman Catholic, Presbyterian, Methodist and one Salvation Army barracks. There are three hospitals, six schools, a commercial college and numerous banks and public buildings. It has woolen mills, paper, pulp, cotton, flour, and planing mills, machine shops and foundries, and manufactories of pottery and agricultural implements. Building stone is quarried in the neighborhood. The city is in a rich agricultural section and has a large trade. The United States is represented by a consular agent. It has weekly newspapers and is lighted by gas and electricity. Pop. (1901) 6,704.

Cornwall, (Lat. *Cornu Galliae,* "horn of Gaul," that is, the remotest land inhabited by Celts), England, a maritime county, forming the southwestern extremity of the island. Its form is irregularly triangular. Its area is 1,357 square miles. The northwestern coast-line is broken by a number of shallow bays. The

south coast is much more broken, and is marked both by bolder promontories and deeper bays. At Land's End, between these two coasts, terminate the hills of the Devonian range. The rivers of Cornwall are numerous but short. Among them are the Fowey, the Camel, the Inny, the Attery, the Lynner, etc. The climate, owing to the elevation and exposure of the surface, is very variable. The soil, consisting of decomposed slate, admits of easy drainage, but requires much manure. In many of the more elevated districts much of the land is almost barren. Nearly 70 per cent of the total area is under cultivation, a large amount of grain being grown, and much land being devoted to market-gardening for London consumption. Cattle, sheep, and horses are reared. The mines of copper and tin still constitute the richest treasures of the county, though the value of both has greatly diminished. The chief mining district is in the southwest part of the county. Several mines exceed 350 fathoms. In the once productive Botallack copper mine, situated a few miles north of Land's End, the workings are on the very verge of the cliff, and, descending beneath the sea, are carried far beyond low-water mark. The Dolcoath mine, near Camborne, is the chief tin mine, and there are other important tin mines in the same locality. The value of tin ore produced in 1898 was about $1,450,000. The production of copper has greatly decreased in recent times. Besides tin and copper, silver, lead, zinc, iron, manganese, antimony, cobalt, and bismuth are found in comparatively small quantities. China-clay is an important mineral product, being valued at $1,415,000 in 1898. There are few manufactures, but the fisheries, particularly of pilchard and mackerel, are valuable.

At the time of the Roman conquest Cornwall was occupied chiefly by tribes of Cimbri and Damnonii, and became included in the province of Britannia Prima. After the Romans withdrew the natives regained their independence, and retained it till the time of Athelstane, when they were subdued by the Saxons. Their Celtic origin is fully established by the abundance of rude monuments spread over the country, and consisting chiefly of unwrought stones placed erect, singly or in circles, with others laid across. It is divided for parliamentary purposes into six divisions, each returning one member. Pop. about 323,000. Consult Boase, 'Bibliotheca Cornubiensis' (1874–78).

Cornwall, kôrn'wal, or **Cornwall-on-the-Hudson**, N. Y., a village in Orange County on the west shore of the Hudson River, at the foot of Storm King Mountain. The beauty of the adjacent scenery and the proximity to New York city, which can be reached in less than two hours by the Erie or the West Shore R.R., makes it a favorite summer resort. A carpet mill gives employment to a fourth part of the inhabitants. Pop. (1900) 1,966.

Cornwallis, Caroline Frances, English author: b. Kent 12 July 1786; d. Lidwells, Kent, 8 Jan. 1858. She acquired a thorough knowledge of Latin and Greek, and making herself conversant with nearly every study which occupies thoughtful men, from an early age, carried on a correspondence with many eminent persons. Her refusal to accept the hand of the Italian historian, Sismondi, did not forfeit his friendship, and she lived much in Italy. Her first work, 'Philosophical Theories and Philosophical Experience, by a Pariah' (1842), was the first of a series of 20 'Small Books on Great Subjects,' the said subjects including the 'Connection of Physiology and Intellectual Science'; 'Ragged Schools'; 'Criminal Law'; 'Greek Philosophy,' and the 'History and Influence of Christian Opinions.' She also published in 1847 'Pericles, a Tale of Athens,' and her 'Letters and Remains' appeared in 1864.

Cornwallis, Charles, Marquis of, English general: b. London 31 Dec. 1738; d. Ghazipur, India, 5 Oct. 1805. He was educated at Eton, and Cambridge, and entering the army served in 1761 in a campaign of the Seven Years' war as aide-de-camp to the Marquis of Granby. After passing through all the various promotions he obtained the rank of general. He represented the borough of Eye in Parliament from 1760 until the death of his father in 1762, when he succeeded as Earl Cornwallis. In 1770 he was made governor of the Tower. In Parliament he generally supported the ministry, but exercised an independent judgment on several important questions. In particular he was opposed to the policy which brought on the American war; but though offered a special leave of absence from the king sailed with his regiment when it was ordered to America in 1776. He served with distinction under Gens. Howe and Clinton in the campaigns of 1776–9 in New York and the Southern States, and in 1780 was left in independent command in South Carolina, with 4,000 men. He defeated Gen. Gates at Camden 16 Aug. 1780, and Gen. Green at Guilford 15 March 1781. He then invaded Virginia, but after moving his forces according to successive and contrary instructions from Sir Henry Clinton, he was besieged in York Town, where he had intrenched himself, and compelled to surrender on 19 Oct. 1781. In 1786 Lord Cornwallis was sent to India with the double appointment of commander-in-chief and governor-general; and not long after the government of Bengal declared war against the Sultan of Mysore for an attack upon the Rajah of Travancore, the ally of the British. The first campaign was indecisive; but in March 1791, he invaded Mysore, captured Bangalore; and in the year after besieged the city of Seringapatam, and obliged the sultan, Tippoo Saib, to sue for peace, and surrender a large portion of his dominions. On the conclusion of the war Lord Cornwallis returned to Great Britain, and in 1792 was created marquis, appointed master-general of the ordnance, and admitted a member of the privy council. In 1798, at the time of the rebellion, he was appointed lord-lieutenant of Ireland, which office he filled until 1801, conducting himself with great firmness and judgment. In the same year he was sent to France, where he signed the Peace of Amiens. In 1804 he was again appointed governor-general of India.

Cornwallis, Kinahan, American lawyer and miscellaneous writer: b. London, England, 24 Dec. 1839. After two years in Australia he came to the United States in 1860, and since 1886 has edited the 'Wall Street Daily Investigator.' Among his many works are:

'Yarra Yarra, or the Wandering Aborigine' (5th ed. 1885), in verse; 'Howard Plunkett' (1857); 'My Life and Adventures' (1860); 'Pilgrims of Fashion' (1862); 'The Gold Room and the New York Stock Exchange' (1879); 'A Marvelous Coincidence' (1891).

Cornwell, Henry Sylvester, American poet and physician: b. New Hampshire 1831; d. New London, Conn., 1886, where he was a physician. From many poems published singly by him he issued but one collection, 'The Land of Dreams and Other Poems' (1878).

Cornwell, William Caryl, American banker: b. Lyons, N. Y., 19 Aug. 1851. He was cashier of the Bank of Buffalo (1873–98); organized and is president of the City National Bank of Buffalo. He is well known as a clear and forceful writer on currency and banking. He has published 'Currency and Banking Law of Canada' (1894); 'Sound Money Monographs' (1897); 'What is a Bank?' of which 500,000 copies have been sold or distributed.

Coro, kō'rō, or **Santa Ana de Coro,** Venezuela, a town in the state of Falcon, near the Gulf of Coro, an inlet of the Gulf of Maracaybo, two and a fourth miles from the Caribbean Sea, on which is its port, Vela de Coro, about seven miles distant by railway. The trade was once considerable, but is now much fallen off; as is also the town since 1578, when the seat of government was transferred from it to Caracas. Pop. 9,000.

Coroados, Indians of Brazil, the name being derived from their tonsures, just as the name Botocudo is applied to other aborigines of the same country who wear botogues or labrets. It is an arbitrary collective title for ethnic fragments whose tribal names have been lost. Tribes thus designated are found at the present day in some of the southern States of Brazil, especially in Paraná, Rio Grande do Sul, São Paulo, and Matto Grosso; but only a few thousands remain in scattered groups, evidently representing different stages in development, though in a general way the Indians of the Upper Paraná and Upper Paraguay region may be classified as true aborigines, "the nearest representatives, and probably the direct descendants, of that primitive race whose osseous remains have been found in Lagoa Santa caves and Santa Catarina shell mounds." Consult: Keane, 'Man, Past and Present'; Porter, 'Native Races.'

Cor'ody, or **Corrody** (Lat. *corrodium,* "provision"), an allowance of meat, drink, or clothing, anciently due to the king from an abbey or other religious house, for the sustenance of such of his servants as he put there for maintenance. Corodies were also retained by the private founders of religious houses and were granted to benefactors, and consisted in the right of a certain number of persons to be boarded at an abbey.

Corolla, kō-rŏl'a, the inner whorl of two series of floral envelopes, occurring in the more highly developed plants, the outer being the calyx. In all cases its divisions, which are called petals, alternate with those of the calyx. They are generally colored — namely, they are some other color than green. The corolla is, as a rule, larger than the calyx. When the petals of a corolla are all distinct, they are said to be polypetalous, and this is the normal type. When they cohere continuously by their margins they are called monopetalous, or, better, gamopetalous, meaning that the petals are joined. The petals of a corolla are really only modifications of leaves. The corolla merely assists reproduction by shading the productive organs from injury, and, in some cases, by secreting honey attracts bees and other insects to aid in their fertilization.

Cor'ollary (Lat. "crown," or "garland," and in a derived sense "gift"; hence something given or granted), in logic, a proposition the truth of which appears so clearly from the proof of another as not to require separate demonstration.

Coromandel (kŏr-ō-măn'dĕl) **Coast,** the east coast of the Indian Peninsula, between Calimere Point and the mouths of the Krishna. It is open, sandy, and has no secure harbors; the surf, continually beating on it, renders landing difficult, often dangerous, and it is commonly accomplished in native boats of a peculiar construction. A violent monsoon accompanied by hurricanes blows from the middle of October well into December.

Coromandel Wood, another name for calamander wood (q.v.).

Corón, kō-rōn', Philippines. See PEÑON DE CORÓN.

Corona, kō-rō'na (a crown), in astronomy, a halo or luminous circle round one of the heavenly bodies; specifically the portion of the aureola observed during total eclipses of the sun, which lies outside the chromosphere or region of colored prominences. (See HALO.) In botany the corona is an appendage of the corolla in some flowers, coming as it were between the corolla and the stamens, well seen in the cup of the daffodil. In architecture it is the lower member of the projecting part of a cornice. See ARCHITECTURE, Plate I.

Corona Australis, ôs-trā'lĭs (the southern crown), one of Ptolemy's southern constellations, containing 49 naked-eye stars, varying from the third to the seventh magnitude.

Corona Borealis, bō-rē-ā'lĭs (the northern crown), one of Ptolemy's northern constellations, containing about 30 stars visible with the naked eye, α, Gemma, of the second magnitude, being the chief of a curved row of seven stars of the fourth and fifth magnitudes. In 1866 a new star of the second magnitude appeared in the constellation, but soon after became invisible save with a glass.

Cor'onach. See CORANACH.

Coronado, kō-rō-nä'thō, **Carolina,** Spanish poet: b. Almendralejo, province of Badajoz, 1823. About 1848 she married Horatio J. Perry, an American, who died in 1874. After his death she lived in retirement in Lisbon. She was precocious, and published a collection of poems in 1843. Her lyrics are distinguished for melody and depth of feeling. Her few dramatic pieces had little success; but her novels and short stories,— especially 'Jarilla' (1850) and 'The Wheel of Misfortune' (1874),— and her little sketch of travel 'From Tagus to Rhine,' won popular favor.

Coronado, Francisco Vasquez de, fränthēs'ko väs kĕth'dā kō-rō-nä'dō, Spanish explorer: b. Salamanca, Spain, about 1500; d.

Mexico after 1542. On the arrival in Culiacan of Alvar Nuñez, Cabeça de Vaca, from his extraordinary journey from Florida in the year 1530, when he brought news of the existence of half-civilized tribes far to the North, living in populous cities, acquainted with the arts, and possessing quantities of gold, silver, and precious stones, an expedition was sent out under Marco de Niza, in 1539, to explore the regions referred to. The result tended to strengthen the belief in the existence of great wealth among the nations far to the north, and a second expedition was fitted out under Coronado, which departed from Culiacan, on the Pacific coast, in April 1540. He passed up the entire length of what is now the Mexican state of Sonora to the river Gila. Crossing this he penetrated the country beyond, to the Little Colorado (called by him Rio del Lino), and paid a visit to the famed cities of Cibola mentioned by Cabeça de Vaca and De Niza. In the kingdom were seven cities, but he declares that there was no truth in the reports of his predecessors regarding their wealth. "All was quite the contrary," he adds, "saving only the names of the cities and great houses of stone." From Cibola, Coronado traveled eastward, visiting several towns occupied by a similar people to those he had met, which are recognized in the existing villages of the present Pueblo Indians. He proceeded eastward to what he calls the "big river," which is the Rio Grande, where he heard of the great city of Quivira. In their journey eastward they "met with a new kind of oxen, wild and fierce, whereof, the first day, they killed fourscore, which sufficed the army with flesh." They continued to Quivira, almost 300 leagues distant, by their account, traversing "mighty plains and sandy heaths, smooth and wearisome, and bare of wood." Coronado's narrative is of value as it furnishes the first authentic account of the buffalo, the great prairies, and the desert plains of New Mexico. It describes, too, with every appearance of truth, the towns of the Pueblo or semi-civilized tribes of Indians, as they existed more than 300 years ago, and which are still found in New Mexico.

Corona'tion, the act of crowning a sovereign; the pomp or assembly attending the investiture of a monarch. Justin II., who succeeded Justinian I. 565 A.D., was the first emperor crowned with ceremony by the Patriarch of Constantinople. Charlemagne adopted the custom, and was crowned by the Pope, at Rome, 800. Edward I. (the Elder), crowned in 902, is said to have been the first English monarch to adopt the ceremony. The custom of crowning the queen originated in England before the Conquest. The French queens were for a long time crowned at the abbey of St. Denis, near Paris. Edward the Confessor fixed the monastery founded by him at Westminster as the place for the coronation of the English monarchs. The real history of the coronation stone, which legend makes Jacob's pillow and geology proves of Scotch origin, is that it was transferred from Ireland to Scotland at an early period, and was placed in the abbey church of Scone in 850. The Scottish kings were crowned here till 1296, when Edward I. carried it to England. It was agreed by the treaty of Northampton, in 1328, that the stone should be returned to Scotland, but this was not done. It is called the "Stone of Destiny," and is fixed under the seat of the coronation chair, which is made of oak, and is now kept in the abbey of Westminster. In the actual coronation service in England, litany, ante-communion service, and sermon are followed by the administration of the oath upon the Great Bible. The archbishop anoints the sovereign, gives him a sword, which is offered as an oblation and then redeemed, invests him with robe and orb, puts the ring on his finger, and after giving him sceptre and rod, crowns him, repeating a collect in the king's behalf. The peers are then presented to the king and a communion service follows. Save in Great Britain coronation has been little practised since the middle of the 19th century, because of the attendant dangers to the king.

Coronation Gulf, an inlet on the northern coast of British America into which empty the waters of the Coppermine River.

Coronea, kŏr-ō-nē'a, a small town of Bœotia, southwest of Lake Copais, where in 447 B.C. the Bœotians defeated the Athenians and became the leading state of Greece; and in 394 Agesilaus defeated the allied Greeks. The town is now in ruins.

Coronel, kō-rō-nĕl', Chile, a port in the province of Concepción, on the Araucobai River, important on account of its coal mines. The customs receipts were 670,040 pesos in 1901 and 544,932 pesos in 1902. Pop. 5,000.

Cor'oner, a functionary whose name coroner, or crowner, implies that he has principally to do with pleas of the crown or in which at least the crown is concerned. His office is very ancient, mention being made of it in 925 A.D. His office in England was peculiarly a county institution. In Alfred's time he was appointed by the king, but since Edward I.'s time the office has been elective. His duties originally had to do with inquiries into fires, and cases of wreckage and of sudden death, but now his court is a court of record in which, after sight of the body of one who has died in prison, or so suddenly that suspicions of violence may be excited, a jury summoned for the purpose pronounce a decision as to the cause of death. The proceedings under the auspices of the coroner prepare the way for a criminal prosecution. He also officiates as a sheriff's substitute when the sheriff himself is interested in a suit, and cannot therefore act in it himself. In the United States the coroner is an elective county officer. His duties are similar to those of a coroner in England.

Cor'onet, an inferior crown worn by the nobility. The coronet of the Prince of Wales consists of a circlet of gold, on the edge four crosses *pattée* or between as many fleur-de-lis; and from the centre crosses rises an arch surmounted by an orb and cross. The coronet of a duke is adorned with eight strawberry leaves above the gold rim; that of a marquis with leaves and pearls interposed; that of an earl has the pearls raised above the leaves; a viscount's coronet is surrounded with pearls only, as is a baron's; but in the latter case the number is restricted to four.

Coronis, (1) in Greek mythology, the daughter of King Phoroneus, whom Neptune loved, and who was changed into a crow b Minerva; (2) the mother of Asclepius

Coro'nium, a hypothetical chemical element, supposed (by some astronomers) to exist in the sun. The evidence in favor of its existence consists in certain bright lines that are seen in the spectrum of the solar corona at the time of a total eclipse, and which are not known to be due to any recognized terrestrial element. On account of the great height above the sun's surface to which the matter that gives these lines extends, coronium has been assumed to be far lighter than hydrogen, which is the lightest known terrestrial element. Certain French and Italian scientists have reported the discovery of coronium in terrestrial volcanic gases; but their results need confirmation, and the existence of the supposed element, even in the solar atmosphere, has not yet been demonstrated.

Corot, Jean-Baptiste-Camille, zhŏñ bäp-tēst kä-mēl kō-rō, French landscape painter: b. Paris 28 July 1796; d. there 22 Feb. 1875. Against the wishes of his family he studied art, first under Michallon, next under Victor Bertin, and then passed a year or two in Italy. In 1827 he first exhibited in the Salon, but it was not till nearly 20 years afterward that his genius in landscape painting was generally recognized. The last 25 years of his life were spent in affluent circumstances (his professional income being immense, and his father's death having brought him a large fortune) and in the happiness engendered by success. In 1867 he was made an officer of the Legion of Honor. Skilful as a figure-painter, it was in landscape that Corot excelled. He was a diligent student of nature, whose aspects he idealized on canvas with no profusion of color, but in sober tints of brown, pale-green, and silver-grays. He was pre-eminently successful in painting scenes in the faint lights of dawn and twilight, behind a transparent veil of mist, the early rays glinting through dense foliage, mirrored in sparkling water. There is a sameness in Corot's work which forbids him the very highest rank, but within his own province he was inimitable. Among his works may be mentioned: 'Danse des Nymphes' (1851); 'Martyrdom of St. Sebastian' (1853); 'Morning' (1855); 'Evening' (1855); 'Sunset' (1857); 'Orpheus' (1861); 'Rest' (1861); 'Solitude' (1866); 'Landscape with Figures' (1870); 'Pleasures of Evening' (1875); and 'Danse des Amours.' The Boston Art Museum contains his 'Dante and Vergil'; the Metropolitan Museum in New York his 'Ville d'Avray,' and there are various other works by him in public and private American galleries. Consult Blanc, 'Les Artistes de mon temps' (1879); Rosseau, 'Camille Corot' (1884); Thomson, 'Life of Corot' (1892); Stranahan, 'History of French Painting' (1899).

Corozal, Porto Rico, a municipal district of the department of Bayamon. Pop. (U. S. War Dept. Census) 11,508, including 7,286 native whites, 56 foreign whites, 364 negroes, 3,797 mixed, 5 Chinese, and 6,441 persons over 10 years of age who could neither read nor write.

Corozal, Porto Rico, a town in the department of Bayamon. Pop. 1,057.

Corozo-nut. See VEGETABLE IVORY.

Cor'poral, in the army, a non-commissioned officer with nominal rank under a sergeant. He has charge of small bodies of men, places and relieves sentinals, etc. In the British army there are five corporals to each company of infantry, and four to each troop of cavalry. There are also soldiers distinguished by the designation of lance-corporal, who are privates acting as corporals but receiving only privates' pay. In the United States Army a corporal is the lowest non-commissioned officer. His especial duty is to place and relieve sentinels. The corporal wears two chevrons on his sleeve as a mark of his rank, the lance-corporal one only. A ship's corporal is an officer who has the charge of setting and relieving the watches and sentries, and in general assists the master of arms. See also ARMY OF THE UNITED STATES.

Corporal, the linen cloth laid on the altar, on which the sacred vessels are set during the consecration of the elements of bread and wine in the Mass or Holy Communion. It is to be distinguished from the veil, which is used to cover the chalice and paten, and the palla or pall (q.v.).

Corporal Punishment, punishment applied to the body of the offender. In its connection with civil government it technically includes flogging, imprisonment, and the death penalty, but in common parlance its meaning is more restricted. Various extreme and cruel methods of punishment once in vogue have been discontinued in Christian nations, but are still practised in Oriental countries and among uncivilized races. Corporal punishment was once considered indispensable in school discipline, and was very severe in form in the schools of Europe before the advent of the Innovators (q.v.). Since that period its moral and even its immediate practical benefits have been increasingly questioned, and its practice has gradually lessened. American schools have gone farther in this respect than those of Europe. This form of punishment is forbidden by the school law of New Jersey, and to a greater or less degree is restricted in many municipalities of the other States. See BASTINADO; CANG; FLOGGING; TORTURE.

Bibliography.—Mann, 'School Punishment'; Painter, 'History of Education'; Rein, 'Outlines of Pedagogics'; White, 'School Management.'

Corporal Trim, a servant of Uncle Toby in Sterne's 'Tristram Shandy.' He is an old soldier and performs his duties in strictest military fashion.

Corporate Control, the control of any trade or industry by a single corporation and not by many firms of unlimited liability. The growth of the corporate form of organization in the United States has been an evolution from rigidly circumscribed beginnings. In the popular estimation they were viewed with suspicion; the original charters were subjects of special legislative action and were granted only to associations of a large and semi-public character, such as railroad, canal, steamship, and water-supply companies.

With the growth of the corporate form of organization popular prejudice against it gradually declined, the legislative view underwent a change, and a wide range of industries was

brought under corporate form of organization. At first charters were granted only by special statute and were often made exceedingly expensive. The legislatures retained this prerogative in some States until forced by constitutional amendment to relax it and frame general laws providing for their organization. Now there are but few States in the North that have not a general corporation law, in which not only the organization but the limitations and responsibilities of corporations are provided for.

The chief advantage of the corporate form of organization is in the limited liability feature. The members of a partnership are all liable to the full amount for all the debts of the firm, and a single partner has it always in his power to commit the firm to undertakings beyond its capacity and to involve it and his partners in financial ruin. But the liability of the corporation extends only to its corporate assets, and of the shareholders only to the extent of their respective holdings fully paid in.

The corporate form also enables the individual in business without associates to set apart a portion of his capital for his own particular business, with merely nominal shareholders in the same undertaking, and to rest assured that no accidents or misfortunes of business will involve him beyond the amount of stock paid up, which he holds in the company. Where the stock is only partly paid he is held liable to the amount remaining unpaid for debts of the corporation.

Again in most important undertakings the established custom or "good will" of the business in time becomes one of the valuable, not infrequently the most valuable, of assets of the establishment. In the case of a partnership or firm this might be lost or destroyed by a dissolution or the death or defalcation of one of the partners. In case of a corporation it is not affected by anything except the failure or dissolution of the company.

The corporation continues, and no dissolution is required or imposed by the death of a shareholder. And in case a part owner desires to withdraw his capital from an undertaking, if a partnership, it frequently imperils the entire business, but, if a corporation, is without power to affect the life of the business or the interests of associates.

And in case of the failure of the corporation the individual proprietors, or shareholders, escape the stigma of insolvency — are often even classed with the creditors, and may in such a position be influential in effecting a valuable reorganization. In disputes that lead to litigation it is the corporation that sues or is sued, but in a partnership the firm name and the names of the partners individually are involved.

Nor does the insolvency of any shareholder have any effect upon the corporation or its other shareholders, while it would ordinarily compel the liquidation of a partnership.

And in a partnership each partner has the financial fate of his associates in his hands, but in a corporation he can do only what he is especially authorized to do by the constitution and by-laws of the organization or by resolution of its board of directors, and his power to commit the corporation can be closely limited.

Corpora'tion, a corporate body legally empowered to act as a single individual, and having a common seal. A corporation may be either aggregate or sole. Corporations aggregate consist of two or more persons legally incorporated in a society, which is kept up by a succession of members, either in perpetuity or till the corporation is dissolved. A corporation sole consists of a single individual and his successors, the intention being to perpetuate a function or office which cannot be done in any man in his personal or bodily capacity. Thus in Massachusetts certain church property is vested in a corporation sole composed of the pastor of the church. To render valid a transfer of lands to such a corporation, the phraseology must always include the words "and his successors." In England the king or a bishop is a corporation sole, as the office is immortal though the man may die.

Corporations are liable to the ordinary laws and treaties of the country, but are not citizens in the sense of exercising a political or municipal franchise. United States law has also had occasion to emphasize the distinction between a public corporation which may be affected by legislation, and a private corporation. Further, according to United States law, the franchises of a corporation are treated as realizable assets for creditors. The amount of property which may be held by a corporation in the United States is frequently limited in the act or charter.

Corporations in Commerce. Among the corporations that are defined in the above article (See CORPORATION) only the ordinary joint-stock concern, operated for the profit of the shareholders, is here considered.

Even as late as the beginning of the 19th century there were but few business corporations in America, while those which had been created were comparatively insignificant so far as the matter of wealth was concerned. Of course, there were some banks which could boast of quite respectable capital, as well as a few insurance companies of some means, but the greater number of these corporations were turnpike companies, stage-coach companies, and manufacturing concerns. So far as the general run of business was concerned, however, it was conducted either by individuals or under partnership agreements, and it was not until the growth of trade in almost every department of commercial activity had attained considerable proportions that the moneyed men of the country began to realize that the corporation offered several advantages over the old-fashioned partnership idea. Not the least in importance was the advantage which such opportunities afforded to outsiders to invest in promising enterprises without assuming the too great liability incurred under the partnership laws. In other words, persons having a little unemployed capital could invest such a sum as he felt himself willing to lose, with the certainty that no exigencies of the business could compel him to risk more than his original investment.

In the beginning of the history of American corporations the power of the Legislature in the organization of such concerns was practically without restraint. For a time no fault could be found with this method, but, gradually, as abuses crept into the process, it was discovered that the power of these State bodies must be limited. In the eye of the law a corporation had been regarded as a person, but as a person

of this description had no body that could be imprisoned, it was found that it was difficult to control such a concern under the penal statutes as they then existed. It was mainly for this reason that the State Legislatures began to pass general laws to regulate the organization and management of corporations, for it was hoped that in this way it might be possible to confine each company to its own particular business. Since those days, from time to time, efforts have been made by the various State Legislatures to enact a systematic code to regulate the business of corporations. Thus, many of the States now have one general law for the banking corporations, another for the insurance concerns, another for railroads, still another for trust companies, etc., while other States, following the example of the English Parliament, have adopted statutes enabling corporations to conduct any legitimate business not already provided for under the general laws.

Of course, there can be no questions but that corporate organizations have been of the utmost advantage to the financial growth of the nation. Greater economy in production, one of the factors certain to result from such organizations, has been of benefit to the poor by reducing the cost of both the necessities and the comforts of life. If space permitted it would be possible to cite hundreds of illustrations to indicate the widespread character of this reduction, for, in fact, it would be difficult to name any considerable number of those articles which are usually classified as necessaries, or even comforts, that have not been materially reduced in price through the direct influence of corporate management. Take, for example, our modern facilities for traveling, a factor which has contributed directly to the comfort and convenience of those who reside in the country districts. Then, too, the security and cheapness of such facilities of communication as the mail service, the telegraph, and the telephone, represent conditions which have only been made possible by the intelligent and harmonious co-operation of many corporations working together with unity of purpose. To the insurance corporations we owe the protection of our property from loss by fire, as well as many other causes. To the life companies we owe the protection of our families from want when death or disability deprives them of their breadwinner. Our savings banks keep safe watch over our surplus earnings and give them back to us, with interest, when we most need them. Our national banks enable us to carry on our business operations with the rest of the civilized world, with full reference to the requirements of expedition, security, and economy. In a single word, wherever we turn we are confronted with conditions which the exigencies of modern life have made necessary, but any one of which would have been impossible without the aid of corporate organization.

It is sometimes difficult to imagine how consolidation should tend to a reduction in the price of articles of general consumption when it it a well-known fact that it is competition that directly tends to bring about such results. The apparent paradox, however, is easily explained. It is true, for example, that consolidation lessens the possibility of competition, and that, primarily, the union of all the competing concerns in any particular line of trade might easily effect an advance in prices, but the fact, which has been well proved by experience, that there is more money to be made in selling a large quantity of goods at a small profit than can possibly be realized by disposing of a small output of goods at a large profit, has tended, not only to the production of better goods but also to an ultimate reduction in prices.

While it is impossible to say how greatly our national commerce and our country's development has been advanced by the existence of corporate organizations, it cannot be denied that the advantages which we have derived from them have to some extent been counterbalanced by certain evils for which they may be held responsible. For example, there can be no question but that the concentration of wealth in the hands of a few corporations has been the means of forcing the individual producer out of the business field. Prior to the creation of these corporations the towns and villages of the country were the scene of many small industries conducted by skilled workmen who had saved sufficient capital to enable them to go into business for themselves. It has required but a comparatively few years to bring about the almost complete extinction of that class which once represented the best element of American citizenship, the men of moderate means who conducted small business enterprises upon their own account, and the fact that these independent business men are now included in the lists of the high salaried workmen of the large corporations does not detract from the fact that their absorption is a distinct loss to the community. To about the same extent the consolidation of these varied business interests has resulted in the quite general disappearance of the commercial traveler. In the old days, when the business of the country was almost exclusively in the hands of individual or partnership traders, business houses not only sent their personal representatives to visit their customers, but they owned the facilities by which their trade was carried on. Large houses had their own vessels, or were part owners of them, and exercised other means of enterprise by which profits were accumulated that were far in excess of those which are realized by the consolidated trading interests of this day. The invention of the submarine cable, by means of which a corporation has placed us in direct and almost instantaneous communication with every part of the world, has added greatly to the extension of our foreign trade, but, instead of being conducted by individual shipowners, the individual has retired from the shipping business and has left the carrying trade of the world in the hands of the corporations. As these corporate bodies are largely backed by foreign capital, the international business of the world is done in foreign ships, manned by foreign sailors, which is a distinct misfortune in view of the fact that this competition has tended so greatly to the disappearance of American craft and American sailors in the shipping industry. While other causes may also have had an effect in producing these conditions there can be no doubt that the existence of the corporation is, at least, partly responsible for them, and the question whether the reduction in the cost of living which may be traced to this source is sufficient to compensate us for our disappearance from the maritime world is a difficult one to answer.

Another evil which has resulted from cor-

porate control of the business affairs of the country may be seen in the steady decline in the standard of business morality and honor. While there are instances in which large fortunes have been made for the individual stockholders in these corporations, there have been other cases in which the investor has lost all his money. Sometimes this misfortune has been due to the fact that the project itself was conceived under unfavorable circumstances, but it cannot be denied that many schemes have been floated for the direct purpose of fleecing the investors. Bonds have been issued upon no other security than a franchise which has cost the company nothing, and, while a fraction of the proceeds has sometimes been used in construction, the bulk of the money has generally been distributed among the promoters. Moreover, in companies that have not been conceived for fraudulent purposes, the administration of affairs has too often been so advantageous to the directors as to be unfair to the stockholders. Large fortunes have been made, both by the manipulation of stock by the directors, in which the shareholders suffered, and by the bleeding of the treasury by directors who have engaged in outside transactions with their own company. By these means, and in almost countless other ways, dishonorable men in high official positions have succeeded in diverting the revenue of some of the greatest corporations from its stockholders, that they themselves may benefit from this misuse of the power imposed in them by a too-confiding public. In the old days, when men prided themselves upon the high standard of their business honor and morality, no honest man would have thought of trading upon the knowledge acquired by reason of his position as a director, any more than he would have thought it possible for him to decrease the value of an estate of which he was trustee that he might profit by the loss of those who trusted him, and yet there are plenty of men to-day who would deem it preposterous if they should be told that it was dishonorable to trade in the stocks of the corporations which they control.

Another abuse of power by the corporations is represented by their effort to secure franchises of the most enormous value for a very inadequate consideration. Trading upon the needs of the towns and cities throughout the country, they have secured the rights to use the streets for their elevated and surface roads, as well as for water, gas, electric plants, etc., upon terms that have worked great hardships upon taxpayers who have submitted for the sake of the conveniences which they have promised.

Corporations, National Control of. In considering the question of the national control of corporations, three aspects present themselves. In the first place Alexander Hamilton in 1796 said: "We are laboring hard to establish in this country principles more and more national and free from all foreign ingredients so that we may be neither Greeks nor Trojans, but truly Americans." Herein he established a precedent for the intelligent thought of to-day in regard to corporate legislation. The whole trend of our affairs is to the establishment of principles more and more national, and free from sectionalism so that we may be truly Americans. The second phase is that interstate warfare, unfavorably affecting trade and commerce, has frequently resulted in Federal assumption of jurisdiction over the matters in dispute as involving the public welfare. The third point is that whenever in the history of this nation any force truly national affecting, or relating to, the welfare of the country has been found to outgrow the swaddling-clothes of the express power of the Constitution, the American people have always over-ridden new technicalities and availed themselves of the implied powers of the Constitution.

The country demands uniform national corporate legislation formulated with a view to the good of the nation as a whole and supplanting sectional legislation. A National Incorporation Act, along the lines of the National Banking Act, permissive not mandatory, for the organization of corporations, national in extent, whose business is between States or with foreign countries, might be such a law, and certainly would be immeasurably superior to the the national control of State-created corporations in affording the protection of the national government against conflicting State legislature and local political enactments and, what is equally important, enforcing well-considered regulations and wholesome restrictions similar to the provisions of the national banking system. A National Incorporation Act should be based upon the public demand for clearer uniform legislation on a vital business foundation with proper control and proper restrictions. Provisions for publicity and similar requirements made under Federal jurisdiction and thereby less subject to evasion, attract the attentions of the *whole* nation, and could not be passed with the secrecy and despatch of a State act, emanating from a legislature that might be engaged in a competitive warfare for reward from corporations.

Trusts are a national force. While the word trust has not become generic to the extent that it is defined by all alike, nevertheless one may be satisfied to accept the term as indicating a corporate aggregation engaged in national business, not confined in its operations and scope to the State of its creation. Included are commercial combinations, financial aggregations, and any other organization which tends to concentration and consolidation of force. The trust has advanced beyond the province of mere academic discussion. Whatever be the promoting or direct cause of combinations, they are to-day an integral element in the nation's struggle for commercial supremacy. Nor is the tendency to combination, concentration, and aggregation of power as yet at its height. Its progress will be as great in the future as it has been during the last decade.

The national force and international power of this movement, realized and recognized by Americans and foreigners alike, has led to discussions based far more upon conjecture than upon actual experience, since the advantages, and at the same time the dangers, of these gigantic combinations have up to this time been outlined rather than demonstrated. From the standpoint of the undoubted advantage to the country, some are inclined to advocate perfect freedom to combinations through the United States and the doing away with legal limitations upon their progress and growth; they urge the liberalization of our corporation laws without regard to proper control or wholesome

restrictions. On the other hand, having in mind the potential dangers involved in the possession of power of any kind, others are inclined to advocate devoting the entire legislative energy to the repression and suppression of the trust movement, their conviction being that the centralization and enlargement of power accompanying the formation of vast combinations, unless brought under rigid restriction, must present more than a mere menace to the well-being of the country.

The safe principle, however, is found in the statement that the trust problem is not the problem of abolishing industrial combinations, but of properly applying the principles which they represent, recognizing that they are a power national in extent and a necessary subject of Federal jurisdiction. Discussion as to the legal control of combinations must be not primarily utility and secondarily control, but utilization and control, standing on the same footing. The trusts of to-day are a national force and power in that their business not only extends through all the original and acquired territory of this country, but is rapidly overleaping the boundaries of our States and possessions, entering into foreign countries and making rapid inroads into foreign markets; and national in extent also in that their financial roots extend down and into every commonwealth and municipality of this country.

Investing stockholders of the so-called trusts and combinations are innumerable and widely scattered; the list of stockholders of a single corporation contains over 5,000 investors scattered throughout the United States. Special emphasis must be given to the term "investing stockholders," as showing the hold which these organizations have taken upon the people of this country; a safeguarding both for the country and for the corporation, but a menace besides, inasmuch as an industrial panic would not be confined to the bankers and financiers of Wall Street, but would be felt in every village, town and city throughout the United States.

It has been said that the death of a financier controlling the policies of great industrial combinations would affect the industrial, financial and commercial interests of the United States, more than would the death of a President of the United States. Be this as it may, it needs no demonstration to show that the trusts of to-day are a force national in extent and are a fundamental part of the commercial and financial growth of this country. Correlated with this proposition is the equally demonstrable statement that, in so far as power and force present advantages to this country, to the same extent that power and force, uncontrolled, must tend to become a menace.

Legal Character of Trusts.— Not only are these combinations the creation of legislation and of limited geographical jurisdiction, but in many respects the courts of the State that created them have jurisdiction of their internal affairs to the exclusion of the courts of the States into which they may go; the general rule being that, where the act complained of affects the complainant solely in his capacity as a member of the corporation, whether it be as stockholder, as director, president or other officer, and is the act of the corporation, whether acting in stockholders' meeting or through its agents, the board of directors, such action is the management of the internal affairs of the corporation, and courts of the State which created the corporation have jurisdiction to the exclusion of courts of other States. It has been further held that it is immaterial that the visible tangible property of the foreign corporation is situated in a State where suit is brought and that all questions as to the organization of the foreign corporation, its corporate functions, who shall become its members, and what are their rights as members, should be relegated to the courts of the State which created the organization. Thus the rights of a Boston stockholder in a South Dakota organization are determined by the judge of the South Dakota courts interpreting the statutes of South Dakota. The members of the great financial combinations practically located in New York, with their millions of capital, are relegated to the courts of New Jersey for a determination of their rights as stockholders. And the foreclosure of the properties of great trusts, properties, real and personal, in various States, are ordered, decreed, modified and stayed by courts in New Jersey. The United States Supreme Court refers such matters back to the States.

Public Opinion.— Apart from the personal character of the officers in charge, the great controlling influence upon the combinations is public opinion. This is of two kinds: unformulated, that is, that which is created by discussion, by literature and chiefly by the press; and formulated public opinion,— the statutes. The latter, because of their enacting power, should be the highest form of public opinion; but to-day, under our system of State legislation, that proposition is reversed.

If the best thought, the majority of the best minds, the integrity of intellect of this country, can convince the people of the United States as a whole, that certain lines of control are for the good of the people as a nation, then a national legislative body should create Federal statutes as wide as the interests involved, and as broad as the public opinion which demands the law. Such, however, is not now the case. The subject is national in extent, the interests are national, the best public opinion is national, but legislation is State and sectional. All laws are supposed to be but the formulation of an intelligent public opinion based upon an understanding of the situation and a just appreciation of the interest of the parties involved. On the subject of corporation law public opinion to-day, when it reaches what ought to be its highest stage of efficiency, becomes circumscribed and limited in its efficiency; as it is (1) always circumscribed geographically by the limits of the State creating the statute; (2) generally dwarfed in its birth by the subordination of the general principle involved to the local and ofttimes political State issues; (3) frequently limited in its application by the elimination of the question of the good of the nation and by the substitution for the welfare of the country, of the interest, frequently political, quite generally financial, of the State in question, even to the prejudice of other States, and (4) sometimes formulated as a part of a political system which looks to the good of the party, rather than to the best interests of the State.

There is to-day no forum in which a public national opinion in regard to the great national question of trusts, their advantages or disad-

vantages, their uses and abuses, can be heard and the judgment of the nation formulated into a nationally created and nationally enacted public law. All of these great and vitally important national questions are relegated to the geographical limitation, the financial rivalry and the political systems of the States, with a result that South Dakota, West Virginia, and Maine, on their respective lines of policy formulate a public opinion in the shape of a statute which in its resulting effect, passes over and into the State of Massachusetts, relating to and affecting the property of the citizen of Massachusetts, who, as a stockholder in a South Dakota, West Virginia, Maine or Delaware corporation is relegated to the formulated public opinion of that State for the determination of his rights, according to the statutes and laws of that State, perhaps in disregard of public opinion which prevails in his own State. There can be no effective publicity — no effective restrictions or regulation of corporate power under a system of diverse State legislation. Laxity of legislation as a rule fixes the standard upon the principle that "the team is no faster than the slowest horse." Public opinion formulated into statutes, to be of the highest efficiency and to be freed from evils of subordination, must be uniform among all the States and national in extent.

State Systems.— Many States whose corporate system of legislation is of a high order have not only approached this system at the inception of their laws from different view-points, but from that view-point have built up a legislative scheme, and have a thoroughly adjudicated system of case law upon this subject. Massachusetts, Pennsylvania and New Jersey are examples.

Massachusetts strongly, and Pennsylvania perhaps less urgently, insist upon general publicity for all corporations, public, quasi-public or private. New Jersey, on the other hand, insists on and has consistently adhered to the principle of private publicity as being the better doctrine for business companies. As to the issuance of stock, they differ in theory, Massachusetts more nearly taking the position of insisting upon an official State valuation for stock, while New Jersey, not permitting stock to be issued for services (the great means of "watering stock"), permits the issue of stock for property or money, but compels publicity to the extent of requiring the corporation in the certificate of payment of capital stock, and thereafter in each annual report, to distinguish between that stock which is issued for cash and that which is issued for property. By means of private publicity, every stockholder can ascertain for himself for what property the stock is issued.

Massachusetts and Pennsylvania take the stand that stock must be issued for money or money's worth, and that the State and the courts are the judges as to the law and the fact of what is the value of the property for which stock is issued. New Jersey takes the position that this is too dangerous for the stockholders because of the tendencies of juries and courts after a failure, looking backward, to minimize values of property; and therefore she makes a standard the judgment of the board of directors as determined and declared at the time of the issue, provided that judgment is free from fraud.

The trend of State legislation is sometimes to enact laws with a view to procuring pecuniary returns to the State rather than adhering to sound principles. Corporate measures are apt to be weighed by some legislatures, first, upon monetary scales; second, upon political scales; finally, if found satisfactory by these tests, by the standard of propriety and integrity. The controlling question seems to be one of immediate financial returns, of financial expediency and resulting political desirability. Special legislation for the benefit of any particular corporation, because of the revenue the corporation brings or is expected to bring to the State, is open to the charge of being legislation for a price, especially if the character of such legislation be manifestly unsound in principle. The support of a legislative body given to the passage of an act in consideration of a moneyed return, actual or prospective, to the State, provided the act is otherwise unjustifiable, leads to the charge of being State legislation for a price, and to the further charge that this class of legislation tends to corruption on the ground that an example is set by the State, which is sometimes followed by the individual legislator in individually legislating for a price. It is needless to add that this statement is not always well founded; but the fact that such legislation is open to suspicion and gives rise to such charges is a good reason for its avoidance if not its condemnation. The granting of special charters to individual corporations, with special and unusual privileges and immunities, tends to create public distrust, not only respecting the integrity of the legislation, but also as to the freedom from bias of the individual legislator. One of the commendable features of New Jersey's corporate legislation scheme is that the constitution of that State prohibits such special legislation with respect to corporations, and compels all corporations of a given class to incorporate under the same act, with the same rights and privileges, and subject to the same restrictions and control.

The fostering of legitimate capital and the inducing of incorporated capital to locate within the borders of the State are not only legitimate but commendable in every way. Moreover, the securing of proper returns to the State by way of taxes is eminently proper, and economically commendable.

Some charter-granting States legislate for the following classes of corporations: (1) corporations organized primarily for the purpose of doing business which is outside of the State; (2) corporations organized for the purpose of doing without the State business which is forbidden to be done within the State which created them; (3) those formed for the purpose of doing their entire business outside of the State, being specifically forbidden by their charters from operating or carrying on such business in the State which created them; and (4) corporations organized for the express purpose of doing business in evasion, sometimes in violation, of the law of a State into which they propose to go and to operate. On the other hand, we have States attempting to tax property of corporations — as the State of New York in the case of the United Verde Copper Company (People ex rel. United Verde Copper

Company *v.* Feitner, 54 N. Y. App. Div., 217)—not within their limits and therefore taxed elsewhere; and we have some States attacking domestic and foreign corporations with laws tending to make it difficult to associate capital for commercial operations too large for individuals.

As early as 1866 the State of Pennsylvania granted a special charter to the New York California Vineyard Company, giving it power to do the business set out in its charter, "in any of the United States or territories thereof except in the State of Pennsylvania, the same as a natural person." In 1870 the name of the company by special act was changed to the Land Grant Railway and Trust Company and banking powers were granted to it to be exercised "in any State, territory or country except the State of Pennsylvania." The State of Kansas thrust out this corporation from its borders, refusing to allow it to do business there. The Supreme Court (6 Kan. 255), said: "At the very creation of this supposed corporation its creators spurned it from the land of its birth as illegitimate and unworthy of a home among its kindred and sent it forthwith a wanderer on foreign soil. Is the State of Kansas bound by any kind of courtesy or comity or friendship, or kindness to Pennsylvania to treat this corporation better than its creator (the State of Pennsylvania) is bound? . . . No rule of comity will allow one State to spawn corporations, to send them forth into other States to be nurtured and do business there when the State first among States will not allow them to do business within its own boundaries."

In the year 1897 New York introduced certain legislation tending to make the stockholders and directors of foreign corporations personally liable for the debts of the company in New York, provided the corporation failed to conform to certain New York requirements. This was understood to be aimed specially at the numerous New Jersey corporations doing business in New York. As a counter move a bill was drawn, passed by the New Jersey legislature, and signed by the governor, all within 48 hours, making it law that such corporate liabilities created by the statutes of other States were not enforcible in the State of New Jersey. The passage of this act was sufficient to end the usefulness of the New York acts.

New York has its railroad and transportation laws and forbids local railroads, telephone, or telegraph companies to organize under any other act, and refuses to give such organizations power to do business in New York State unless they accept the conditions and restrictions of the railroad and transportation laws. The case of New York is cited because it is the latest among the eastern States to sell telephone, telegraph and railroad charters free from the ordinary restrictions thrown about such corporations, provided their operations shall be removed and kept out of the State of New York, and because this case is indicative of the tendency of the times. Connecticut recently created by a special charter a banking company with power to hold its stockholders' meetings anywhere in the world. In addition to banking powers the corporation was authorized "to transact the business of merchants, manufacturers, miners, commission merchants, agents of every kind, shippers, builders, financiers, brokers, contractors, and concessionaires," to construct private or public works of any sort or kind, "outside the State of Connecticut"; to do a general transportation and railroad business "outside the State of Connecticut"; to say nothing of power to act as common carrier and express forwarder outside of the State of Connecticut.

Many States seem neither to look beyond their own borders nor to legislate for the good of the country at large or the good of the commercial movement of the times. It needs no argument to enable the student of corporate legislation to come to the conclusion that the drift of State legislation is not toward uniformity, but toward interstate warfare. This contest between States has reached the point where the State of Minnesota has openly charged the State of New Jersey with permitting a great corporation to be organized for the express purpose of doing the very things which are forbidden by the State law of Minnesota, and directly affecting property located in Minnesota.

Federal Assumption.—In early days commerce was the subject of a State war between New York and New Jersey. New York imposed a duty on the New Jersey farm and garden products which came into New York. The boats of the New Jersey men were seized and their cargoes confiscated, if they attempted to escape the payment of this duty. New York had put on a bit of sand shore, now known as Sandy Hook, a lighthouse for the guidance of commerce coming into New York city. New Jersey in retaliation taxed this at the rate of $1,800 a year. The Supreme Court of the United States ended that war.

New York granted to Robert Fulton and others the exclusive right to operate vessels propelled by steam up and down the Hudson River and into the waters of New York Bay. Men from other States who attempted to navigate vessels by steam from points in New Jersey to New York were enjoined by the New York courts. The United States Supreme Court freed trade and commerce from State exactions and from interstate warfare by holding that States had no jurisdiction over what is to-day called interstate commerce, and the decision in Gibbons *v.* Ogden (9 Wheaton, U. S. 1) is interesting reading from a retrospective standpoint. Many other instances might be cited, but the principle is well recognized.

Corporate Legislation in Germany and Austria.—Prior to the 19th century there were few business organizations in Germany, and these were semi-public institutions. Few, if any, joint stock companies were organized in the first 30 years of that century. It is true that there was no political power at that time that could establish uniform corporation laws for all of Germany. The practices of different states differed materially. As a rule, a special act of incorporation was required for the formation of a business company in practically all of the states, and Hamburg and Bremen alone permitted the free incorporation of joint stock companies.

Subsequent to 1830 the construction of railways, the development of banking and insurance, and finally, the development of large scale production in manufactures, led to the formation of many joint stock companies and a demand for corporation laws of more utility. Austria

in 1838 passed a general railroad law. Prussia enacted similar legislation later in the same year. In 1843 Prussia created a new law concerning joint stock companies in general, and in 1852 an imperial "patent" was issued in Austria on the same subject. These laws made some concessions to business companies; yet they required special authorizing acts for the formation of a company, and in many other respects were far from the modern idea of corporation laws.

As early as 1857, a realization of the evils of diversity of corporation laws led to a public demand for a reforming of corporation statutes. At that time, Prussia and Austria were the only states with general laws, excepting some of the Rhine provinces. In Hamburg and Bremen freedom of incorporation existed by prescriptive right. In many of the states it was a matter of controversy whether special authorization was or was not required for the formation of a corporation. The demands of a growing and modern business finally compelled the German states to adopt what were then radical measures. Between 1861 and 1865, to a certain degree uniformity of legislation was secured by the adoption of a commercial code (Handelsgesetzbuch) by the separate states. This, among other things, required a special act of authorization for the formation of a corporation and required the states to exercise strict control over such companies; yet it permitted individual states to allow freedom of incorporation, and accordingly Baden, Oldenburg, Würtemberg, and Saxony soon made this concession to business interests, as did the cities of Hamburg and Bremen. In 1868 or 1869 the commercial code was made a law of the North German Confederation. Yet, although some degree of uniformity was now secured, the law of Germany was too illiberal for the needs of modern business. In 1870 the Reichstag amended the law of 1868 in such a way as to permit freedom of incorporation; and this act has been the foundation of all later legislation of the German empire. This business demand for uniformity of legislation, and, as well, uniformity and concurrence of jurisdiction, led to the adoption of the commercial code by voluntary action of the separate states; it led the North German Confederation to make corporation laws the subject of federal legislation; and, under the present German empire, it has resulted in imperial control of laws relating to business corporations.

Publicity.— Public opinion demands publicity, and that demand is being met by many corporations. We find charters of great organizations voluntarily prescribing broad publicity and making it obligatory on the part of the management.

Publicity is of two kinds, public and private. Private publicity means giving full information to each stockholder. This is the first step. Public publicity means giving this information to the public at large and that, too, whether the organization be a public corporation, a quasi-public corporation or a private company. As a matter of fact, private publicity is simply presenting the thin edge of the wedge, and public publicity is sure to follow in all cases where the proposition is a matter of interest to the public. In the case of a small corporation with half a dozen stockholders, the information may be confined to those stockholders, but the operation is not likely to be large or to affect the public. On the other hand, if there are many stockholders and its stocks and securities are held as investments, many people will earnestly inquire about it, and by means of the enforcement of private publicity many people will find out the details, and therefore the country at large will know them. Public publicity is the logical result of private publicity in all cases where the public is sufficiently interested to make inquiry. Publicity will give a clear insight into the operation and workings of a trust and when this is fully known the public will know how to deal with the proposition as a whole.

Every corporation man recognizes the proposition that to-day there is practically no such thing as enforced publicity in its length and breadth throughout the nation. Neither are many other economic demands enforced under State legislation. State legislation is more easily controlled than national, it can be managed more quietly and more secretly. Bills for the benefit of some particular corporation or corporations, are said to be cloaked sometimes under the disguise of a public measure. They are amendments so-called to existing laws, but they are actually the thrusting of new, and ofttimes evasive matters into a section of the statute in which they do not belong. Such acts can be passed in State legislatures. They are not noted by the public because they are not always commented upon by the press.

An act passed in South Dakota affecting fundamental rights of the stockholder of a great corporation, a law quietly enacted in Delaware or in West Virginia, might not be the subject of national discussion and national comment, and therefore, a national public opinion might not have an opportunity to be heard before its passage. The managing editor of a great daily might not censure the news department if a bill should be introduced, rushed through and passed in the legislature of South Dakota or Delaware affecting a corporation whose visible and tangible property was in Massachusetts; but should a "sneak act" affecting great corporate interests be introduced at Washington, and on the very day of its introduction the majority of the press throughout the United States not be apprised of its introduction, there would be trouble. A Federal law would tend to put all legislation, proper and improper, in a glass case and expose it to the views of the entire public. Proper publicity would not only be obtained, but also maintained by the national act. Upon the introduction of any corporate law under a national system the representatives of every State would be heard upon the subject. Public opinion of every locality would be transmitted through the representative of that locality and made an integral part, either in the opposition or in the promotion of the measure. A National Incorporation Law would truly represent and formulate the public opinion of the nation.

The Form of a National Act.— With some hesitation I suggest that a national act might contain some of the following elements: First: It should be optional with corporations, as in the case of the National Banking Act, to organize under the State acts if they choose. Second: The law should prohibit the use of the name "national" to any but national corporations, compelling other corporations which assume that

title to relinquish it. Third: A national corporation should be protected from State attack to the same extent to which national banks are protected, namely, it should not be subject to attachment or other provisional remedies which prevail in some States against non-residents. Fourth: National corporations should be assured of the privileges and immunities guaranteed to natural persons by the Constitution of the United States and discrimination against them by State laws forbidden. Fifth: National corporations should have freedom from State supervision and should be subject to taxation by the State only to the amount of property actually in the State, and then upon the same basis as an individual. Sixth: The national corporation should be subject to national supervision and examination, and at least private publicity should be compulsory, which would eventually result in a proper degree of public publicity. Seventh: An annual report should be made by the corporation to the Federal authorities, showing the taxing situs of all its property. Such information should be collated by some Federal authority and furnished to the taxing officers of the various States in order that the corporation might be justly and correctly taxed. Eighth: A national corporation should pay taxes upon all its property locally where property is situated. Its stock in the hands of stockholders might be exempted from taxation of every nature.

In the organization and creation of our system of national banks the way was paved for an extension of this system to other corporations. Neither the Constitution of the United States nor Federal or State statutes so distinguish between banks and other corporations that the analogy cannot be reasoned out. The constitutional warrant for the national bank would seem to include a similar warrant for the industrial combination. We have therefore before us an example of national corporations in our national bank system.

It is fitting to close this article with the language of one whose writings are entitled to profound respect. In his commentary upon the works of Alexander Hamilton, Mr. Henry Cabot Lodge said:

"The danger, inconvenience, and utter inefficiency of the State banks are still freshly remembered. The country groaned and chafed under them for more than 20 years, until the Republican party came into power and established the present system of national banks. The new plan did away with the State banks by absorbing them and thus destroying the active and interested opposition which confronted the old Bank of the United States and its predecessor. The present system seems to be firmly and permanently established. It embodies Hamilton's two great principles — national banking, supervised by the central government, and a national bank currency. Hamilton's policy of national banking has become an integral part of our financial system, and has prevailed over all the attacks which have been made upon it. There is another side, however, to the question more important than its financial results. This is the constitutional argument employed by Hamilton in his Cabinet opinion to which allusion has been made in a previous note. In this famous Cabinet opinion Hamilton summoned to his aid the doctrine of the implied powers of the Constitution, and the establishment of the bank was the first triumph of that principle which has done more than anything else to build up and strengthen the power of the national government."

JAMES B. DILL,
Counselor to Corporations.

Corps, kōr (Fr. "body"), a word often used in military and political language. The term is applied to various kinds of divisions of troops; *corps d'armée* is one of the largest divisions of an army (the German *Heeresabtheilung*); *corps de garde,* a post occupied by a body of men on watch; also the body which occupies it; *corps de reserve,* a body of troops kept out of the action, with a view of being brought forward if the troops previously engaged are beaten, or cannot follow up their victory, or are disorganized; and *corps volant* (a flying body) is a body intended for rapid movements.

In political use, *corps législatif* was used from 1857 to 1870 of the lower house of the French legislature; its members were elected for six years. *Corps diplomatique* refers to a nation's entire body of ambassadors, ministers, and other diplomatic officers.

Corps of Engineers. See ENGINEERS.

Corpse (Lat. *corpus,* "body," through Fr. *corps*), a dead body, usually animal, and in most common usage applied only to the human body. To the human corpse there can be no property rights, save in the rare case of disposition by regular will of one's body. Questions as to disposition of a corpse must be heard by an ecclesiastical court in England, by the usual civil courts in the United States, and elsewhere if Church and state be independent. Prior right to a dead body naturally goes to the nearest of kin, marriage ties ranking those of blood. Burial expenses come under the general head of property rights in that they take precedence over any claims against deceased or his estate. Privileges of the corpse extend still further, pagan superstition, which identified to a certain degree body and soul, and long established Christian belief in the resurrection of the body, combining with the law's view, to make mutilation of the buried body, or body-snatching, as digging up the corpse for anatomical or other purposes is called, detested and criminal. Both practices are still widely exercised and public opinion seems less severe than formerly. See BURIAL; CREMATION; MAUSOLEUM; MUMMY; etc.

Cor'pulence, the state of the human body when loaded with an excessive quantity of flesh and fat. The flesh forms the muscular system; and its extent being limited by the form of the particular muscular parts, its quantity can neither exceed nor fall below a certain bulk. The fat is much less limited, and the production and deposition of it is confined to no such definite form. The accumulation of fat depends, in a certain degree, on the state of the health. Children and females have a larger proportion of it than adult men. It is promoted by rich diet, a good digestion, inactivity, tranquillity of mind, etc. There is, however, a diseased state of the system, which, independently of all these influences, will increase the production and deposition of fat. Indeed, corpulence in many cases appears to bear no proportion to food, and

is evidently a disease. A well-known example of corpulence is Daniel Lambert, who exhibited himself in London early in the 19th century. His weight was 704 pounds, and his height 5 feet 11 inches. In recent times much attention has been paid to this subject, a result partly owing to the wide circulation of a pamphlet written in 1863 by William Banting, a London tradesman, who reduced his own troublesome obesity by a regular course of diet. The starch, sugar, and fat of the diet he suggested, are reduced to a minimum. They are, as a matter of fact, less than is sufficient for the liberation of heat and energy. Consequently, the stored-up fat of the body would be drawn upon to yield what was deficient in the diet. In the second place, the richness in nitrogenous material would stimulate oxidation changes, and, aided by exercise, would hasten the consumption of the deposited fat. The diet was successful with Banting, but as a matter of fact it is a modified starvation diet. It is not, therefore, to be hastily tried by everyone with a tendency to stoutness. Its main principles are: avoidance of all foods rich in carbohydrates, or very sparing use of them, notably potato, white bread, rice, sago, tapioca, corn-flour sweets, sweet fruits and sweet vegetables — like carrot, turnip, parsnip, beet-root — reduction of fat, butter, cream, and abstinence from sweet wines and ales. On the other hand, there are allowed all kinds of lean meats, lean fowl, and lean fish, eggs, game, green vegetables, succulent fruits, natural wines, bitter ale in small quantity, and spirits. Brown bread should be substituted for white.

Modern German physicians have been particularly fortunate in their treatment of corpulence. Ebstein of Göttingen allows the use of fats, urges eating asparagus, spinach, cabbage, and other albumen-carrying vegetables, but excludes carbohydrates. Stokes and Oertel combined gymnastics, notably mountain climbing, with careful dieting. Mineral water cures are common, and the Kissingen water is particularly efficient. Dr. Schweninger of Munich won great repute by his cure of Count von Bismarck; his method was based on a careful analysis of each case and upon a study of the patient's previous ailments. In short, he recognized that corpulence is usually a result of various abnormal conditions which must be remedied as a preliminary to direct treatment.

Corpus Christi, kôr'pŭs krĭs'tē, Texas, city and county-seat of Nueces County; on Corpus Christi Bay, at the mouth of the Nueces River, and on the Mexican National, and the San Antonio & Aransas Pass railroads, 140 miles south of San Antonio. Corpus Christi has regular steamboat connections with New Orleans. It is the stock-raising and farming centre of the county, and has an extensive fish and oyster-packing business, several daily and weekly newspapers, a Catholic convent, several churches, a national bank, and an assessed property valuation of $2,000,000. Pop. (1900) 4,703.

Corpus Christi College, Cambridge, Eng., sometimes called Benet College, was founded in 1352 by the united guilds of Corpus Christi and the Blessed Virgin, two fraternities which used to meet for prayers at Saint Benedict church and Saint Mary's respectively. The endowments of the college were considerably increased by Archbishop Parker, who also bequeathed to it his valuable collection of manuscripts. It consists of a master and 12 fellows, besides 26 scholars. The college has the patronage of 10 livings. The college has a wonderful collection of plate and the Lewis collection of printed books. Christopher Marlowe and John Fletcher were members of Corpus Christi.

Corpus Christi College, Oxford, Eng., a comparatively small college founded by Richard Fox, bishop of Winchester and lord privy seal, under a license from Henry VIII. It consists of a president, 15 fellows, 28 scholars, 7 exhibitioners, and two chaplains. Three of the fellowships are annexed to two professorships, the professors occupying the position of honorary fellows, being elected by boards appointed by university statute. The college has the patronage of 16 livings. It counts some famous men among its members, notably Udall, author of 'Ralph Roister Doister'; Richard Hooker Keble, the hymnologist; Thomas Arnold, Master of Rugby, and Chief Justice Coleridge.

Corpus Christi, Festival of, a holiday instituted in the Roman Catholic Church in honor of the mystery of the Eucharist. Its observance began in the diocese of Liège while the archdeacon of that diocese was James Pantaleon, who afterward became Pope Urban IV. In 1264 Urban composed a bull ordering throughout the Church the celebration of the festival on the Thursday following the first Sunday after Pentecost: the bull seems not to have been promulgated save, perhaps, in the city of Rome, for though the festival was duly observed by the Pope and his court, no proof exists of its celebration on that year or after for a long time in other parts. The proximate occasion of Urban's act was the reported occurrence of a miracle at Bolsena in the papal dominion, when a priest in saying the mass accidentally spilled out of the chalice some drops of the sacramental species of wine and tried to cover it up with a linen cloth: forthwith the cloth was covered with red spots in the form of the sacred host. The bull of Urban was revived at the Council of Vienne, 1311, by Clement V., and succeeding pontiffs down to the Council of Trent were zealous for the observance of the holiday. The Council of Trent declared the institution to be a triumph over heresy regarding the doctrine of the Eucharist.

Corpus Delic'ti (literally "the body of the crime or offense"), in Scots law, those external marks, facts, or circumstances which accompany a crime, and without the proof of which the crime is not supposed to be established. There is no correspondent expression in English, but the term is common to the civil law of continental Europe. Here we should say that certain proofs are indispensable to establish a crime, and that unless they exist there is no legal ground to convict the party; so that *corpus delicti* is equivalent to the proofs essential to establish a crime. According to German law no crime can be established unless the *corpus delicti* is clearly present, and self-accusation or confession without this does not empower a court to convict.

Corpus Doctrinæ, dŏk-trī'nē (Lat. "body of doctrine"), in German ecclesiastical history, the name given to each of several collections of theological writings promulgated by various Ger-

man Protestant churches during the 16th century. Among the most important of these collections were the 'Corpus Misnicum' or 'Philippicum' (1559), enforced by the elector of Saxony, containing the Apostles', Nicene, and Athanasian creeds, the Augsburg Confession, and Melanchthon's 'Loci Communes'; the Pomeranian of 1561; that of Nuremberg of 1573; and the Hamburg (1560), Brunswick (1563), Pomeranian (1564), Prussian (1567), Brunswick-Wolfenbüttel (1569), Saxon (1570, called Corpus Thuringicum); and others of a Lutheran character. These were all superseded in 1580 by the 'Formula of Concord.'

Corpus Juris Canonici, jū'rĭs ka-nŏn'ī-sī, the body of laws for government of the Church enacted by popes, councils, and synods, or drawn from the writings of the fathers, and the whole approved and promulgated by the holy see. There were numerous collections of canons made and published both in the East and the West prior to the time of Gratian, the Camaldolese monk, professor of theology in the University of Bologna, who in 1139 compiled the *Decretum,* called also *Decretum Gratiani,* which constitutes the first part of the body of the canon law: it is the first methodized general collection of Church laws from the time of Constantine to the year of its publication, and is in three books, treating, the first, of ecclesiastical persons and offices; the second, of cases arising under the several canons, decretals and other authoritative rules; and the third, of the sacraments and rites of the Church. The second part of the Corpus Juris Canonici is the Decretals of Gregory IX., promulgated in 1234. This book contains all decretal epistles of popes from 1139 to the date of its publication. It is followed by the Liber Sextus, 1298, promulgated by Bonifacius VIII.; by the Clementinæ or constitutions of Clement V., 1317; finally the Extravagantes, revised in 1563, contain all decretals promulgated to that date. With the Extravagantes ends the systematic compilation of matter of canon law. In the reign of Henry VIII. the English Parliament ordered a revision of the Corpus Juris Canonici to make it conform to the new order of things brought about by the law of the king's supremacy in matters of religion: meanwhile the old system was to hold so far as might consist with the new order. But no revision has been made, and hence, with a few reserves, the Corpus Juris Canonici is law for the Church of England.

Corpuscle, kŏr'pŭs-l, in anatomy, a small, usually microscopic, body regarded by itself and defined by some qualifying term; as, blood corpuscles (see BLOOD); the Malpighian corpuscles of the kidney and of the spleen; the tactile corpuscles, otherwise known as Meissner's, Wagner's, and palpation corpuscles, found in certain papillæ of the skin of the hand and foot, the gustators or taste corpuscles of the papillæ of the tongue, etc. See PACINIAN CORPUSCLES.

Corpus'cular (or Emission) Theory of Light, the older theory, which explained the phenomena of light by supposing that a luminous body emits excessively minute elastic particles of matter, "corpuscles," as they were called, which, striking the eye, produce the sensation of light. These corpuscles were supposed to travel in straight lines with equal velocities; reflection was explained not as a case of the impact and rebounding of one moving solid from another fixed one, but as due to repulsion by the molecules of the reflecting surface; refraction was produced by the attraction of the refracting body. The supporters of this theory found great difficulty in explaining how reflection and refraction can co-exist, and in adjusting it to include the phenomena of absorption, the unequal refrangibility of the different colors, etc.; and latterly it assumed a most arbitrary and complicated form. The theory is now completely displaced by the "undulatory" or "wave" theory. Newton held the corpuscular theory, and supported it with great ingenuity, and among its other eminent advocates were Laplace and Biot. A long and interesting controversy was carried on with respect to the truth of these theories, which engaged, some on one side and some on the other, all the most illustrious mathematicians and naturalists of Europe from the time of Newton almost till our own day. See ELECTRON; LIGHT.

Corpuscular Philosophy, a name sometimes applied to the atomic philosophy taught by Leucippus and Democritus. According to their doctrine matter is eternal, and everything in the whole universe, including the soul itself, is produced by a special arrangement and aggregation of minute indivisible bodies or particles called "atoms." These atoms are of various sizes and shapes, and, in some forms of the theory, of different qualities; and it is on these primary differences, combined with the endless varieties of position and figure, that distinctions between things are based. Change is but a rearrangement of atoms caused by their unceasing primary motions. This philosophy was elaborated and developed by Epicurus and other thinkers, and received its grandest expression in the great poem of Lucretius, 'De Rerum Natura' ('On the Nature of Things'). It may be regarded as an ancient form of the modern atomic theory, which, however, differs from it in being, not a philosophy of the universe, but merely a hypothesis concerning the physical constitution of matter, adopted in order to give convenient expression to scientific facts and to aid in scientific advance. Le Sage, in his celebrated and ingenious explanation of universal gravitation, assumed the existence of what he called "*ultramundane corpuscles,*" to whose impact attractions between bodies were due. If a body were isolated in space it would be equally bombarded on all sides by these small bodies from beyond the confines of our universe, but if it were placed in the neighborhood of another body, each would intercept a certain number of corpuscles which would otherwise have bombarded the other. Thus the bombarding force is no longer equally distributed, and there is a resultant attractive force acting between the two bodies.

Corral, Poinciano, pō-ēn-chē-ä'nō kŏr-räl', Central American general: b. Costa Rica about 1810; d. Grenada, Nicaragua, 8 Nov. 1855. As commander of the Nicaraguan troops he defeated the filibusterer William Walker (q.v.) in the early part of 1855, but later made terms with Walker, and became minister of war. He was subsequently detected in treasonable correspondence with the Legitimists, and after a trial by court-martial was shot by Walker's order.

Correa de Serra, José Francisco, hō-sā' fran thēs'kō kōr-rā'a, Portuguese scholar: b. Serpa, Alentejo, 6 June 1750; d. Caldas, Rainha, 11 Sept. 1823. He was educated in Rome and Naples, was admitted to holy orders, and soon after his return to Portugal in 1777, was made perpetual secretary of the academy recently instituted at Lisbon. He collected cabinets of natural history, especially of botany, established a laboratory for scientific research, and prepared for the press numerous unpublished documents relating to the history of Portugal. Accused before the inquisition, he escaped to Paris in 1780, but was permitted to return to Portugal after the death of Pedro III. At Paris he had been intimately associated with the naturalist Broussonet, and became the host of the latter when he fled in disguise from the reign of terror to Lisbon. Endangered by the detection of Broussonet, he took refuge first in Gibraltar and then in London. He lived in Paris in learned society and pursuits from the Peace of Amiens till 1813, when he came to this country, where he continued his scientific studies, and in 1816 became minister plenipotentiary of Portugal. He was recalled to Portugal on the promulgation of the constitution of 1820, and made minister of finance. His most important writings are treatises on the physiology of plants, and a collection of inedited memorials of Portuguese history, in 1790–1816.

Correction of the Press. See PROOFREADING.

Correggio, Antonio Allegri, än-tō'nē-ō älā'grē kōr-rēd'jō, Italian painter, frequently called Antonio da Correggio, from the place of his birth: b. Correggio 1494; d. there 5 March 1534. He was intended for a learned profession; but nature had designed him for an artist. It has not been ascertained how much he was indebted to his first instructor, who was probably his uncle, Lorenzo Allegri. Three qualities will always be admired in him — grace, harmony, and a skilful management of the pencil. There is a peculiar grace in the movements of his figures, and a loveliness in their expression which takes possession of the soul. These attitudes and movements could not be executed by any artist without his masterly skill in foreshortening, which not only gives greater variety to a piece, but is also favorable to gracefulness. Avoiding all roughness and hardness, Correggio delights by mild and almost effeminate beauties. He strove to obtain this object also by harmony of coloring, of which he may be called the creator. He is unrivaled in the *chiaroscuro;* in the grace and rounding of his figures, and in the faculty of giving them the appearance of advancing and retiring, which is the distinguishing excellence of the Lombard school, of which he may be considered the head. In his drapery, he calculated with extreme accuracy all the effects of the *chiaroscuro.* He possessed the power of passing, by the most graceful transition, from the bright colors to the half tints. It was his object to make the principal figure prominent, that the eye, after gazing till it was satisfied on the bright colors, might repose with pleasure on the softer masses. He made a skilful use of this art in his 'Night' (*la Notte*), which is to be seen in the gallery in Dresden, where there are seven pictures in which his progress in the art may be recognized. Among his best pictures, besides the 'Night,' are the 'St. Jerome,' which has kindled the admiration of several distinguished painters to such a degree as to render them unjust toward Raphael; the 'Penitent Magdalene'; the altar-pieces of St. Francis, St. George, and St. Sebastian; 'Christ in the Garden of Olives'; 'Cupid'; the fresco painting in Parma; and, above all, the paintings on the ceiling of the cathedral in the same city. The story of his extreme poverty, and of his death in consequence of it, has been long since disproved, yet Oehlenschlager has made it the subject of one of his best tragedies in German and Danish. Consult Meyer, 'Correggio,' Heaton's translation (1870); Landon, 'Vie et œuvres de Correggio' (1803–20); Morelli, 'Critical Studies of Italian Painters' (Vol. II.) (1893); Ricci, 'Antonio Allegri da Correggio' (1896).

Correggio, Italy, a city in the province of Emilia, about 25 miles northwest of Modena. The modern town has none of the importance of the mediæval city, which was the capital of the principality. Its importance in history is due to its having been the birthplace of the painter Correggio. Pop. (1901) 14,500.

Corregidor, Philippines, an island lying in the entrance to Manila Bay, and forming a part of the inner line of defense of the city of Manila; length, east and west, four miles; average width, one mile; area, two square miles. It rises on the west coast to a height of 649 feet above the sea; on the highest elevation is the semaphore station of the port of Manila, from which the approach of vessels is signaled. There are also four lighthouses on the island. The island is exposed to ocean storms, and this makes the cultivation of the soil unprofitable; a few crops are raised in the sheltered localities. The chief industries are trade and fishing. The island was strongly fortified by the Spaniards in the 18th century, but the defenses were not well kept up. When Admiral Dewey entered Manila Bay 1 May 1898 he steamed past this island, which was supposed to be very strongly fortified, and to be the base of operations for the mines and torpedoes in the bay. The forts have been strengthened by the United States government, which established a military station here in 1900. Pop. 500.

Corregidor, kō-rā-hē-dōr', in Spain, the principal magistrate of a town, appointed by the king. In Portugal the corregidor has administrative but not governing powers.

Correlation of the Physical Forces, a term introduced by Sir William Grove to denote what may more properly be called the convertibility of the various forms of energy. One or two illustrations will suffice to explain the doctrine. The energy that a bullet in rapid motion possesses may be converted into heat; for example, when a bullet strikes a target it is found to be warm to the touch. Heat may again be converted into kinetic energy, that is, the form of energy possessed by a moving body; for instance, through the intermediation of a steam-engine. Chemical action, another form of energy, may give rise to heat, as when gunpowder is burned; or to both heat and kinetic energy, as when the powder is used to fire off a bullet from the gun; and it is to be noticed that if the same quantity of powder were employed in the two cases, there would be less heat obtained in the second case by an amount that corresponds to that used up in imparting the energy of motion to the bullet. Heat

is directly converted into electricity, and electricity into heat. Electricity in motion produces magnetic effects, while magnets in motion are capable of giving us electricity. The energy of electricity in motion gives rise to chemical action; and chemical action properly applied keeps up an electric current. In connection with this doctrine that of the conservation of energy ought also to be studied.

Correspondence Schools, International. The development of a great educational system by correspondence was a process of evolution from a small beginning, the primary incentive being a mining catastrophe of more than usual magnitude.

On 6 Sept. 1869, at the Avondale Colliery near Plymouth, Pa., a large frame breaker structure which was erected over the shaft was burned while the workmen were in the mine. The shaft was the only opening to the mine, and all of the men and boys in the mine, one hundred and eight in all, perished by asphyxiation. As this was the first great catastrophe in the mines of America it created a profound feeling of sympathy for the mine workers, and made evident the dangers surrounding them. During the following winter the legislature of Pennsylvania passed an act providing for the safety of miners, which required that all anthracite mines in the State should have two openings, and provided various other safeguards. Another act provided for the employment of mine inspectors for each of the coal fields. This first mine law was very crude and imperfect.

In 1885 the mine laws were amended, and a provision incorporated requiring that all inside foremen thereafter appointed at any anthracite mine in Pennsylvania, should be required to pass an examination before a board of examiners, and to obtain a certificate of qualification before they could legally take charge of the inside workings of a mine. Practically all of the mine workers were men of very limited education, although many of them were men of more than average intelligence. Naturally the more ambitious among the miners desired the pleasanter work and increased remuneration of a mine official and they endeavored to equip themselves to pass the examination and secure certificate of competency.

The text-books on the theories involved in coal mining at that time were very few, and the best of them were by English writers and dealt more particularly with conditions in English coal fields. In addition, most of these books on mining were written by men of considerable education and the authors presupposed the users of the books would have sufficient elementary education to understand them. Ambitious miners purchased these books and endeavored by careful reading to fit themselves for the examination. In their studies, they met many formulas which, while comparatively simple to the educated man, were stumbling blocks to them. There were also many principles explained in language which was beyond their comprehension.

At this time Mr. Thomas J. Foster was publishing a technical paper devoted to coal mining called 'The Colliery Engineer.' He conducted in this paper a Correspondence Department, and men who were endeavoring to learn from textbooks made use of this department in asking for explanations of formulas and principles which they did not understand.

In the course of time a similar law was enacted for the bituminous coal fields of Pennsylvania, and from time to time other States enacted similar mining laws. As the coal mining industry rapidly developed, and the number of States requiring the examination of men aspiring to the position of mine foremen increased, there was a corresponding increase in the number of inquiries sent to the correspondence department of 'The Colliery Engineer.' The circulation of the publication was largely increased, and, as it was advisable to broaden its scope and make it a more influential publication, a corporation was organized in 1890, under the laws of Pennsylvania, known as "The Colliery Engineer Company" with a full paid capital of $100,000, which took over the publication, enlarged it and put it in a prominent place among the trade publications of the country. Mr. Foster, who had been the previous owner, became manager of the company, and managing editor of the publication.

The increase in the number of inquiries sent to the correspondence department was so great as to threaten to crowd out of the columns of the publication other important mining matter, and many inquirers requested answers to their questions by a return, or early mail, preferring to pay a special fee for the replies rather than to wait for the next issue of the publication. In 1891 this state of affairs suggested to Mr. T. J. Foster the idea of preparing an elementary course in coal mining, which would cover the subjects embraced in the examination for mine foremen. It was estimated that if a certain number of men enrolled as students in such a course, the expense of writing and publishing the instruction papers would be met, and the course would prove a valuable adjunct to the publication. In the first year more than four times as many men enrolled for this coal mining course as was estimated, and, as a result, it was decided to make the course somewhat more comprehensive.

Additional matter on the care and handling of mining machinery was incorporated in the course, and a new department was added to the business of the company, that is, the school department. This department was known as the Correspondence School of Mines. The success met with by this school resulted in inquiries for correspondence courses from other classes of artisans, and from time to time, there were added courses in mechanics, electricity, architecture, chemistry, civil engineering, sanitary engineering, etc., etc., and a trade name was adopted so that instead of being known as the Correspondence School of Mines, the combined schools were known as the International Correspondence Schools.

The rapid development of this work required additional capital, and the capital of the company was increased until it now has a paid in capital of $4,000,000. A large portion of the capital was required to pay the cost of writing, illustrating, and editing the instruction papers. These instruction papers are a main feature of the system, and have been prepared by the best available talent. They are pamphlets averaging about fifty pages each, and are adapted for the par-

ticular course in which they are used. The student begins with the most elementary subjects — Arithmetic in most cases — and then proceeds in regular order through all the papers in the course. The instruction papers for each course contain only such information as is necessary for the student to have in order to understand the subject he is studying. These courses, being prepared for those engaged in learning or pursuing a trade, are made plain and simple, so that the student can study at home without the aid of a teacher. Each instruction paper sent the student is accompanied by a question paper, the questions being so framed as to draw from the student such answers as will show whether or not he understands the principles involved. After studying the instruction paper he takes the question paper and writes out the answers. These are sent to the schools at Scranton, Pa., where they are corrected and returned to the student. If a passing mark is secured he takes up the next instruction paper. If a passing mark is not secured he is required to study his first paper again, and is kept at the work until he does reach the proper standard. The result is, the student is thoroughly grounded in each lesson as he goes along.

The growth of the schools since their inception in 1891 has been such as to require the erection of special buildings, and the employment of over 3,000 people, fully one half of whom are employed in the home offices at Scranton, Pa., in various capacities, such as officials, text-book writers, instructors, examiners, accountants, printers, binders, etc. The schools occupy two large stone buildings on Wyoming Avenue, used for the corporate offices and accounting department, and another large building which, when fully completed, will cover nearly an entire block, for its instruction department, printing offices, and bindery. The combined floor space of the buildings will be more than seven acres.

In 1901, The Colliery Engineer Company had its charter amended, and its name changed to the International Text-Book Company, and at the same time a charter was obtained for the International Correspondence Schools. The stock of the latter corporation is owned by the International Text-book Company, which transacts all the business in connection with printing, publishing, enrollment of students, etc. The instruction by correspondence is given by the International Correspondence Schools.

The schools are divided into the following different departments or schools known by the names of the professions or branches taught in them: Advertising, Architecture, Arts and Crafts, Chemistry, Civil Engineering, Civil Service, Commerce, Electrical Engineering, English Branches, Languages, Lettering and Sign Painting, Locomotive Running, Mathematics and Mechanics, Mechanical Engineering, Mines, Navigation, Pedagogy, Sanitary Engineering, Sheet Metal Work, Shop and Foundry Practice, Steam Engineering, Marine Engineering, Structural Engineering, Telephone and Telegraph Engineering, Textiles, Window Trimming and Mercantile Decoration. Each of these schools is in charge of a principal, who has under him assistant principals, and a large force of men and women examiners who have been especially trained for the work. They are employed to examine and correct the work sent in by students. Most of the departments mentioned, in addition to the full course covering the subject, have several subdivisions or short courses for students who do not desire to take up and complete the entire subject. Up to date, January 1905, there have been 173 courses prepared and successfully taught. The language courses, French, German, Spanish, etc., are taught by use of a phonograph, the records being sent through the mail.

If a student has any trouble in connection with his studies or wishes special information on particular points he writes to the schools, and the desired information is furnished at once. There are no regular school terms. A student may begin at any time and take as long a time as he pleases to finish the course. Each is a class by himself. All the text-books used by the students are included in the price of the course and the schools pay all postage on letters and other material sent to the student.

As the business of the schools increased, the methods attracted the attention of the prominent educators connected with the various colleges and universities, who closely watched the development and progress of the system. As these men became familiar with the value of the courses, the instruction papers bound into what are known as bound volumes, were purchased by many of the leading colleges and universities as books of reference for use in their libraries. Recently some of the most prominent of these institutions have adopted, either in whole or in part, the instruction papers of the International Correspondence Schools for class work.

Since the establishment of the schools in 1891 thousands upon thousands of men have secured through them such an education in the theory involved in their trades as to fit them for much higher positions than they could ever have attained without such education.

The following figures show how the schools have grown since their inception: At the end of the first three months of their existence, 1 Jan. 1892, there were 115 students enrolled; five years later, 1 Jan. 1897, the total enrollment was 16,325; 1 Jan. 1902 the number had increased to 370,254; 1 Jan. 1903 the enrollment was 500,572; on 1 Jan. 1904 the number of students was 626,367, and on 1 Jan. 1905 the number had reached a total of 742,507. It has students in nearly every part of the world, and reaches every place where the mail is carried.

DAVID C. HARRINGTON.

Correspondence Teaching. See HOME EDUCATION; UNIVERSITY EXTENSION; CORRESPONDENCE SCHOOLS, INTERNATIONAL.

Corresponding Society of London, The, a society founded in London in 1791, its main object being to reform the representation of the people and spread liberal doctrines throughout the country. These opinions became very obnoxious to the government of the time, owing to the gross misrepresentations set forth in their propaganda, and to the excesses which the French revolutionists perpetrated in the name of liberty. The literature of the society became so scathing in criticism of government policies and so violent in general tone that in October 1794 the celebrated John Horne Tooke (q.v.), together with several other members of the organization, were tried for treason, but, through lack of incriminating evidence, were acquitted.

In 1795 and 1796 its meetings were prohibited as being treasonable, and in 1798 one of the members was executed as a traitor, though no proof was brought to bear that he was. The society, however, continued to hold its meetings in secret for some time and to carry on its propaganda work, but the persecutions of its members, collectively and individually, became so persistent, and arrests and trials so frequent, that it dwindled in numbers, and eventually became extinct.

Corresponding States. See MOLECULAR THEORY.

Corrèze, kŏr-rāz, France, an inland department, between lat. 44° 54′ and 43° 44′ N., and lon. 1° 12′ and 2° 29′ E., bounded on the north by Creuse, on the east by Puy-de-Dôme and Cantal, on the south by Lot, and on the west by Dordogne and Haute-Vienne. It is named from the river Corrèze. Area, 2,265 square miles; capital, Tulle. Surface mountainous, especially to the north and east. Soil far from fertile, except in a few of the valleys. Heaths occupy a great extent of surface, and agriculture is in a very backward state. Hay is abundant, and large crops of beet-root are grown, besides maize, barley, hemp, flax, etc., in moderate quantities. Minerals are plentiful, but little worked. The only manufacture of note is that of firearms at Tulle, employing about 1,000 hands. The trade is, principally in horses, cattle, wood, nut-oil, bees-wax, leather, straw-paper, iron, etc. The department is divided into 3 arrondissements, 29 cantons, and 287 communes. It forms the diocese of Tulle. Pop. 318,000.

Corrib, Lough, lŏH kŏr′rĭb, a large lake, the second in size in Ireland, between Galway and Mayo, about 23 miles in length, and varying from 2 to 6 miles in breadth, and composed of two expansions, united by a narrow channel, about half a mile wide at its narrowest part, across which is a ferry. It is about three miles distant from the sea at Galway, where it is only 14 feet above sea-level. It is separated from Lough Mask by a narrow isthmus, through which there is a subterranean channel. Corrib contains many islands and near it are pre-historic stone-circles.

Cor′ridor (Italian and Spanish, "that which runs"), in architecture, a gallery or long aisle leading to several chambers at a distance from each other, sometimes wholly enclosed, sometimes open on one side. In fortification, corridor signifies the same as covert-way (q.v.).

Corrientes, kŏr-rē-ĕn′tĕs, Argentine Republic, a province bounded by Paraguay on the north, by the territory of Misiones on the northeast, and the republic of Uruguay on the southeast, by Entre Rios on the south, and the province of Santa Fé and the territory of Chaco on the west. Area, 48,357 square miles. The Paraná River forms its boundary on the west and north; the Uruguay River on the east; and there are other streams and lakes. Thus the soil is abundantly watered and well adapted to agriculture. Sugarcane, tobacco, cotton, wheat, and maize are grown extensively; the value of the cattle and horses, however, is much greater than that of the crops, the proportion being about six to one. A railway runs diagonally through the province, from the capital, Corrientes, in the northwest, to the southeastern towns on the frontier of Uruguay. Pop. about 277,000. (For government see CÓRDOBA.)

Corrientes, Argentine Republic, the capital city of the province of the same name. It is situated on the left bank of the Paraná River, and for many years has been an active port for both steamers and sailing vessels. At several private shipyards near the city vessels are built of the wood brought from El Chaco, which is remarkably durable. The city, founded in 1588, has a national college, a normal school, and several elementary schools. Pop. about 20,000.

Cor′rigan, Michael Augustine, American Roman Catholic prelate: b. Newark, N. J. 13 Aug 1839; d. New York 5 May 1902. He made his elementary studies in a private school in Newark and at the age of 14 was sent to Saint Mary's College, Wilmington, Del. In 1855 he began his advanced studies in the historic seminary of Mount St. Mary's, Emmetsburg, Md. Here, in his preparatory course, he showed remarkable abilities, taking the class prizes in Greek, Latin, mathematics, history, and French. In the spring of 1859 he graduated from Mount Saint Mary's, and in the fall of the same year entered the American College in Rome. He was the first student from the United States who asked for admission to this now famous college. In Rome on 19 Sept. 1863 he was ordained a priest for the diocese of Newark, United States, but remained in Rome another year for further study. On 5 Sept. 1864 he began his duties in the Newark diocese, and was soon appointed by his bishop as professor of dogmatic theology and sacred Scripture at Seton Hall Seminary, South Orange, N. J. As vacancies occurred in the seminary he was promoted until in 1868 he was made president of the institution. In 1873 he was elevated to the office of bishop of Newark, remaining at the head of this diocese for seven years. In its management his executive ability proved to be equal to his charity. He liquidated debts, established institutions for the waifs, the defectives, and for the protection of the young whose morals might be in danger. The home for the sick was not forgotten, and the schools received substantial aid and encouragement. The number of organized parishes increased, and when, in 1880, he was called to the position of coadjutor of Cardinal McCloskey, archbishop of New York, he left Newark only after earnestly requesting that he might be allowed to remain; but the Pope selected him and he obeyed. In October 1880 he received the papal bulls appointing him archbishop of Petra and coadjutor to the archbishop of New York, with the right of succession. Upon the death of Cardinal McCloskey, Archbishop Corrigan became archbishop of New York, and the pallium was conferred upon him 4 March 1881. This charge he retained until his death. During the years he was at the head of the second largest diocese in the world, everything possible was done to promote spiritual and intellectual life and to care for the poor, the sick, and the homeless. Saint Joseph's Seminary, at Dunwoodie, near the city, is one of the finest ecclesiastical seminaries in the country. Its chapel was the gift of the archbishop. He was looked upon by all men who knew the forces ever agitating the metropolitan city as "a great conservative force, maintaining the social order of civi-

lization against all socialistic and anarchistic attacks, maintaining the rights of property, on which our homes and the rewards of honest toil and hopes of honorable ambition all depend."

Corroboree, kŏr-ŏb-ō-rē' or kŏr-ŏb'ō-rē, the Australian name for a gathering of natives, either for religious or festive purposes. The characteristic feature of these assemblages is a peculiar dance to which the name corroboree is also applied. The gatherings are held on moonlight nights, and generally last the whole night through.

Corrodentia, a group of primitive insects allied to the orthoptera, founded by Burmeister. The corrodentia, as recognized by Brauer, comprise the families *Termitidæ*, *Psocidæ*, and the group *Mallophaga*, or biting-lice. It is not, however, a very natural assemblage of families and by Packard the corrodentia form a sub-order of his order *Platyptera*, including the stone-flies (*Perlidæ*), the *Psocidæ*, *Empidæ*, and *Termitidæ*, or white ants (q.v.). In all except the *Psocidæ* the body is flattened and the head extended horizontally. The prothorax is large, broad, and more or less square, while the chest-pieces (*sterna*) are large and broad, and there are often 11 segments in the abdomen.

Corrodi, August, ow'goost kŏr-rō'dē, Swiss poet: b. Zurich 27 Feb. 1826; d. there 16 Aug. 1885. His first volume of 'Songs' (1853), exhibited graceful versification and deep sympathy with nature, while his songs and dramatic compositions in local dialect, 'Mr. Professor, an Idyll of Zurich'; 'The Vicar, a Winter Idyll'; etc.; had extraordinary success. He translated several of Burns' songs into the Swiss-German dialect, and published 'Shakespeare: Life Wisdom from His Works.' His works are numerous and possess much merit.

Corrosive Sublimate, also called mercuric chloride, $HgCl_2$, bichloride of mercury, perchloride of mercury; prepared by heating mercuric sulphate with dry sodium chloride; the mercuric chloride sublimes as a white transparent crystalline mass, having a specific gravity of about 5.43. It is soluble in about 20 parts of cold water, and very soluble in alcohol and ether. It precipitates albumen, hence white of egg is an antidote. It is very poisonous, and is used to preserve both animal and vegetable substances. It is used in pharmacy as *Liquor hydrargyri perchloridi*, and as *Lotio hydrargyri flava* when mixed with lime. Corrosive sublimate is a powerful irritant and is used externally in skin diseases. It is administered internally in syphilis, usually in conjunction with iodide of potassium. It is also much in use by surgeons in an antiseptic spray and as a cleansing agent for sterilizing their operating instruments. When used as an antiseptic wash for wounds or sores, one part of the salt is usually dissolved in from 2,000 to 5,000 parts of water.

Corro'sives (Lat. *corrodere*, "to eat away"), in surgery, medicines which corrode whatever part of the body they are applied to; such are glacial acetic acid, burned alum, white precipitate of mercury, white vitriol, red precipitate of mercury, butter of antimony, etc.

Corrugated Iron, sheet iron formed with parallel ridges and furrows, so that the cross-section is a continuous waved line. Flat sheet metal tends to buckle and get out of shape with every change in temperature. The corrugations, made in one direction, give it greatly increased stiffness, and adapt it to numerous purposes for which it would otherwise be less available. The sheet metal is corrugated by passing between ridged rollers, whose ridges are opposed like the teeth of gear-wheels. It comes out in the commercial form, and is frequently subjected to a process of coating with zinc, to protect it from oxidation, and is then known as galvanized corrugated iron.

The most important use of corrugated iron is for the flues of large steam boilers. For this purpose mechanism has been devised for forming the metal into annular corrugated flue pipes which present greatly increased resistance to collapse over the plain form. The heating surface is materially increased by the corrugations. Later, a flue was manufactured with spiral corrugations, giving increased strength. This material has also found an extensive use in the construction of cheap partitions, walls, and roofs of temporary structures, and for buildings where utility is more valued than ornament.

Corruption of Blood, in law, the incapacity to inherit, or pass an inheritance, in consequence of an attainder to which the party has been subject. In the United States it was abolished by the Federal Constitution.

Corry, Pa., a city in Erie County, about 26 miles southeast of Erie, on the Erie, the Philadelphia & Erie, and the Western New York and Pennsylvania railroads. It was settled in 1860, and developed rapidly because of the petroleum deposits which underlie the city and vicinity. It has varied manufactures of iron wares, several mineral springs, and is the location of the State fish hatchery. Pop. (1900) 5,309.

Corryvreckan, kŏr-rĭ-vrĕk'an, a noted strait and whirlpool, on the west coast of Scotland, between the islands of Jura and Scarba. The breadth of the strait is about one mile, and because of the noise of the water rushing through it during storms the passage is terrifying, though not very dangerous.

Corsac, kôr'săk, or **Adive** (*Vulpes canis*, or *cynalopex*, *corsac*), a species of fox or dog found in Central Asia, Siberia, and India, sometimes called the steppe-fox. Its color varies from reddish-yellow in summer to a whitish tinge in winter. The Kirghiz hunt the corsac for its soft, thick, warm fur. About 50,000 pelts come to market annually. It is gregarious, prowls by day, burrows, and lives on birds and eggs. The corsac stands captivity well and is often seen in zoological gardens.

Corsair, kôr'sâr (Fr., in origin identical with "courser" or "cruiser"), a term employed to denote pirates or their vessels. By the princes of the coast of Barbary the corsairs of their states were commissioned to attack the merchant ships of foreign nations, and they became the scourge of the Mediterranean. At the commencement of the present century nearly all the nations of Christendom paid tribute to the Barbary states, but the insolence of the dey of Algiers toward Capt. Bainbridge, on his arrival there in September 1800, with the annual tribute, led to remonstrances on the part of the United States. In 1801, Yussuf, bey of Tripoli, declared war against the United States, from dissatisfaction with the amount of tribute, and

a powerful squadron was sent to the north African coast. Tripoli was bombarded by the American fleet in August and September 1804; and on 3 June 1805 a treaty of peace was concluded between the two countries. In 1815 war was declared by Algiers on similar grounds; but Commodore Decatur soon appeared in its waters with a large squadron, captured several vessels, and in a few days compelled the dey to sign a treaty of his own dictation on his quarter deck. He next humbled Tunis and Tripoli; and the example of the United States was followed by European governments until the corsairs were annihilated.

Corsair, The, a poem by Lord Byron, published in 1814.

Corse, kôrs, **John Murray,** American military officer: b. Pittsburg, Pa., 25 April 1835; d. Winchester, Mass., 27 April 1893. He was a cadet at West Point for two years, and in 1860 became a lawyer, but enlisted in the Union army at the outbreak of the Civil War. He was a brigadier-general in 1864; commanded a division in Georgia, and upon the advance of the Confederates against Allatoona, Sherman telegraphed him, "Hold the fort for I am coming," which inspired Ira D. Sankey to compose the famous hymn beginning with these words. Gen. Corse repulsed the enemy and accompanied Sherman on the march to the sea. After the War he was successively collector of internal revenue in Chicago and postmaster of Boston.

Corselet, kôrs'lĕt (French), a little cuirass or armor to protect the body from injury, worn formerly by pikemen. It was generally of leather and pistol proof. More generally the term was used of body armor or of a complete suit of armor. In entomology the corselet is the thorax, or that part of a winged insect which answers to the breast of other creatures.

Corset, an article of dress worn generally by women for the purpose of keeping the form erect and trim. It is usually made stiff by whalebone or steels. The history of the corset seems to date from the times of Homer, as the poet gives an account of the girdle or cestus of Venus. It was in use in Germany in the Middle Ages, and was introduced into France about the time of the Revolution. At an early age it was in use in Great Britain and Ireland, at least in the 18th century, and was worn by little girls as a support for the body.

Cor'sica (Fr. *Corse*), an island in the Mediterranean belonging to France. It is separated from the island of Sardinia, on the south, by the Strait of Bonifacio, about 10 miles wide, and its shortest distance from the mainland is 50 miles. It is distant from France about 100 miles. It is somewhat irregular in shape, but tolerably compact, except toward the north, where it terminates in a long and narrow tongue of land about 22 miles long by about six miles broad. Greatest length, north to south, 110 miles; greatest breadth, near its centre, 53 miles; area, 3,377 square miles. The east coast is remarkable for its uniformity, presenting a line which is broken in only one or two places by comparatively small indentations. To this the west coast presents a striking contrast, a number of deep bays following each other in rapid and almost uninterrupted succession. Of these the most important, proceeding north to south, are the gulfs of St. Fiorenzo, Calvi, Porto, Liscia, Ajaccio, and Valinco. The interior is traversed by a mountain chain, which has its principal direction north to south, but throws out several lateral branches, particularly to the northwest. The highest summits are near the centre of the island, including Monte Cinto, 8,891 feet, and Monte Rotondo, 8,775, while others exceed considerably 7,000 feet, and the greater part of the year are covered with snow. The mountain masses are chiefly composed of granite and porphyry, and appear to be generally overlaid by extensive beds of limestone. From the east and west sides of the chain numerous streams descend to the opposite sides of the coast. They are mere torrents, short and rapid, and altogether unfit for navigation. The largest are the Golo and Tavignano. Along the mouth of the rivers large quantities of debris and alluvium have accumulated which, preventing the egress of the waters, have gradually formed on the east coast a series of lagoons and morasses, and made that part of the island very unhealthy; but with this exception the climate is one of the finest in Europe. The heat is sometimes excessive, but the sky is generally clear, and the air bracing. The summits of its many lofty mountains are covered with pines, evergreen oaks, cork-trees, beeches, and chestnuts. In other parts the hillsides are overgrown with dense thickets of cistus, myrtles, arbutus, and other shrubs. Numerous valleys lie between the lofty ridges, and sometimes plains of considerable extent occur, the soil of which is generally fertile and well adapted for the growth of all the ordinary cereals. Agriculture is in a backward state, and the island produces scarcely a sufficient amount for local consumption. Large tracts of land are uncultivated; the farming implements in use are of the crudest form. The slopes are covered with vineyards; and the olive tree appears to be indigenous. The mulberry, orange, and citron succeed well, particularly in the lower valleys near the coast. One of the most valuable productions of the more elevated districts is the chestnut, on which, at least during the winter months, the poorer inhabitants principally subsist. Among domestic animals, the first place for usefulness and numbers seems due to mules and goats. The principal wild animals are the boar and the fox. Deer are numerous and all the smaller game and wild fowl are common; eagles, vultures, and numerous other birds of prey frequent the mountains, and fish abound. The principal source of mineral revenue is derived from quarries of fine granite, porphyry, and marble. Neither manufactures nor trade have made much progress. The chief exports are wine, brandy, olive-oil, chestnuts, fruit, and fish.

From the Phœnicians, its first colonists, the island took the name of Cyrnos; and from the Romans that of Corsica. On the decline of the Roman empire it was seized by the Goths, and passed from them to the Saracens. In 1481 it fell under the dominion of the Genoese, who retained it, with some interruption, till 1755, when a great part of it was wrested from them and made independent by the celebrated Gen. Paoli. France, claiming it on a pretended cession by the Genoese, obtained forcible possession of it in 1768, after the inhabitants had distinguished themselves by a long and valiant

resistance. At the time of the French revolution, Paoli, who had taken refuge in England, returned to his native land, and unfurling the banner of the death's head (the old Corsican arms), he summoned his countrymen to strike for their independence. With the assistance of the British, who landed 18 Feb. 1794, he reduced Bastia in May, and Calvi in August. Corsica was constituted a kingdom under the government of a viceroy (Gen. Elliot); the constitution and laws of Great Britain were adopted, and a parliament such as Ireland had was established. But a large part of the people were averse to the British, whom they regarded as heretics, and the French party again appeared on the island in October 1796, under Gen. Gentili. Sickness had reduced considerably the effective force of the British, and their position was rendered still more critical by the French occupation of the neighboring city of Leghorn, and in consequence they evacuated Corsica. Since 1811 the island has formed a French department. For administrative purposes the department is divided into five arrondissements — Ajaccio (the capital), Bastia, Calvi, Corte, and Sartene, subdivided into 62 cantons and 304 communes. The most distinguished individuals to whom Corsica has given birth are Paoli and Napoleon. Pop. (1902) 295,589.

Cor'sican Brothers, The, a play once popular in England and the United States, translated by Boucicault from the French drama, 'Les frères corses.'

Corsicana, kôr-sĭ-kă'na, Tex., city, county-seat of Navarro County; on the Houston & Texas and the Saint Louis S. W. R.R.'s; 180 miles northeast of Austin. It is situated in a great oil district, having a large number of wells. The city is the seat of the State Orphans' Home and the Odd Fellows' Widows and Orphans' Home, and has street railways, waterworks, daily and weekly newspapers, and three national banks. Pop. (1900) 9,313.

Corsini (kôr-sē'nē) **Family,** a famous Florentine family, known since the 13th century. 1. André, Saint: b. Florence 30 Nov. 1302; d. Fiesole 6 Jan. 1373. He early entered a monastery in Florence, where he remained for 40 years; he was then made bishop of Fiesole, and sent as papal legate to Bologna, where he was successful in making peace between factions and putting an end to civil war. 2. Laurent, became Pope as Clement XII. (q.v.). 3. Thomas, Italian politician: b. Rome 5 Nov. 1767; d. there 1856. He was a supporter of Pope Pius IX. and was made senator (chief magistrate) of Rome; when the Pope fled from Rome, Corsini went to Florence for a time, but later returned to Rome. 4. Neri, Italian politician: b. Florence 13 Aug. 1805; d. 1 Dec. 1859. He was the younger son of Thomas Corsini, and became one of the leaders of the liberal party in Tuscany. In 1848 he was minister of war and foreign affairs; later the Grand Duke Leopold II. offered him the first place in the ministry and he immediately proposed to establish the constitution. The Duke, however, would not consent to this and went into exile. The provisional government then organized sent Corsini to London to represent Tuscany there.

Corsned, kôrs'nĕd, or **Morsel of Execration,** a form of trial or purgation formerly made use of in England. A morsel of bread, or cheese, often barley bread, said to be exorcised, was administered to a suspected person as a test of his innocence. If the person was guilty, it was held that the morsel would remain in the stomach, and produce pallor and convulsions; if the person was innocent, the morsel would act as a wholesome and nutritious food.

Cor'so, an Italian term first applied to races of riderless horses, then to the long lines of gaily decorated carriages driven through the principal streets of the cities, and afterward to the most fashionable carriage-drive in the city. The Corso, at Rome, stretching from the Piazza del Popolo to the Capitol, and dividing the city into two equal parts, is nearly 3,500 paces in length, and is enclosed by high and mostly splendid edifices; but its breadth is not proportionate; so that in most parts not above three carriages can go abreast. The higher class of citizens take the air in carriages, which form a very long row. This evening promenade, which in all large Italian cities is splendid, and is imitated in very small towns (although it may have only a few coaches), attracts great numbers of spectators on foot. The carnival is the gayest of the festivals, and at this time the Corso appears in its greatest splendor. Goethe has written a description of the Roman carnival and the Corso. See Carnival.

Cor'son, Hiram, American educator: b. Philadelphia, Pa., 6 Nov. 1828. He became professor of rhetoric and English literature at St. John's College, Annapolis, in 1866, and has been professor of English language and literature in Cornell University from 1870. Among his publications are: a 'Hand-Book of Anglo-Saxon and Early English' (1871); 'An Introduction to the Study of Robert Browning' (1886); 'Jottings in the Text of Hamlet'; 'Lectures on the English Language and Literature'; 'The Aims of Literary Study' (1895).

Corson, Juliet, American cooking reformer: b. Roxbury, Mass., 14 Feb. 1842; d. New York 18 June 1897. She established the New York School of Cookery in 1876 and soon achieved celebrity by her writings on cookery and domestic science, her first success being 'Fifteen-Cent Dinners,' a manual for the poor. Her other works include: 'Cooking Manual,' 'Meals for the Million,' and 'Family Living on Five Hundred a Year.'

Corssen, Wilhelm Paul, vĭl'hĕlm powl kôrs'sĕn, German philologist: b. Bremen 20 Jan. 1820; d. Berlin 18 June 1875. After studies in philology at Berlin, and two years spent in teaching at Stettin, he was called in 1846 to lecture at Schulpforta, where he remained till 1866, when ill health compelled him to retire. His earliest important work is his treatise, 'On the Pronunciation, Vowels, and Accent of the Latin Language' (1858–9). It was followed by 'Critical Contributions to the Latin Etymology' (1863); 'Critical Supplement to the Latin Etymology' (1866); and 'On the Etruscan Language' (1874–5), in which he labors with great ingenuity and vast learning to prove against the world that the Etruscan language was cognate with that of the Romans.

Cort, kôrt, **Cornelius,** Dutch engraver: b. Hoorn 1536; d. Rome 1578. In his youth he worked for a printseller at Antwerp. He then went to Venice, where he was warmly welcomed

by Titian, some of whose pictures he was employed to engrave. Cort finally settled at Rome, and established a school of engraving there, and it is said had Agustino Caracci for a pupil. He made the first engraving of the Transfiguration by Raphael, and about 150 prints from the other Italian and Flemish masters. This number, considering the shortness of the engraver's life, and the size and fine style of the plates, betokens a considerable amount of industry; but although he had a complete mastery of the graver, he is reproached with deficiency in discriminating delicate shades and relative distance, or the nice varieties of expression.

Cort, Frans de, Flemish poet: b. Antwerp 21 June 1834; d. near Brussels 18 Jan. 1878. As singer of the quiet joys of home life and conjugal happiness he has few peers in any literature. His original homely lyrics appeared in 'Liederen' (1857–9); 'Zing-Zang' (1866); and a second volume of 'Liederen' (1868). He also translated into Flemish verse 'The Finest Songs of Robert Burns' (1862).

Cort, kôrt, Henry, English inventor: b. Lancaster 1740; d. 1800. Having at an early age conceived the idea of making England independent of foreign countries for the supply of iron, he established himself as an iron merchant at Gosport, Hampshire, and afterward erected iron works at Fontley, near that town, where he expended large sums in perfecting his processes for puddling and rolling iron. His experiments were successful, in spite of the most disheartening opposition of the most powerful iron masters of England. He took into partnership Adam Jellicoe, chief clerk in the office of the paymaster of the navy, but after his partner's death the navy board seized his iron works for claims against Jellicoe, involving Cort in law suits, and eventually in total ruin. While Cort was bowed down by disappointment at the spoliation of which he had been the victim, his inventions began to exercise a powerful effect upon the iron trade of England, and he is now commonly styled "the father of the iron trade."

Cor'telyou, George Bruce, American cabinet officer: b. New York 26 July 1862. He graduated from the Hempstead, Long Island, Institute, 1879, and the State Normal School, Westfield, Mass., 1882. Between 1883 and 1885 he was a general law and verbatim reporter in New York; and a teacher 1885 to 1889, when he entered the public service. He was private secretary to various federal officials in New York 1889–95; was appointed stenographer to the President November 1895; executive clerk February 1896; assistant secretary 1898, and became secretary to President McKinley 1 May 1900. President Roosevelt continued him in this office until the creation by Congress of the Department of Commerce and Labor, when he appointed Mr. Cortelyou its first secretary (1903).

Cortereal, kôr-tā-rā-äl', Gasper, Portuguese navigator: b. about 1450; d. about 1502. He was probably of a distinguished family, engaged in the colonization of the Azores. In 1500 he was appointed by the king of Portugal to command an expedition to explore the northern coasts of North America. He sailed from the Tagus in that year with two ships, ranged the shores of the country afterward called Canada, and freighted his ships with 57 Indians, whom on his return he sold as slaves; and the name Labrador (laborer), afterward transferred to a more northern region, is a memorial of his visit. Soon after he set sail from Lisbon on a second voyage to the same regions, but never returned. One of his brothers who sailed in search of him in 1502, was never afterward heard from.

Cortes, or **Cortez,** Hernando, är-nän'dō kôr-tās', Hernan, or Fernando, Spanish conqueror of Mexico: b. Medellin, Estremadura, 1485; d. Castillejo de la Castra, near Seville, 2 Dec. 1547. He went to the West Indies in 1504, where Velasquez, governor of Cuba, gave him the command of a fleet, which was sent on a voyage of discovery. Cortes quitted Santiago de Cuba 18 Nov. 1518, with 11 vessels, about 700 Spaniards, 18 horses, and 10 small field-pieces, and landed on the Mexican coast. The sight of the horses on which the Spaniards were mounted; the movable fortresses in which they had crossed the ocean; the iron which covered them; the noise of the cannon; — all these objects alarmed the natives; and the adventurer by his address gained over the Totonacs and Tlaxcalans, who were his faithful allies to the last. To keep in check another tribe he built a fort and a few houses, which formed the nucleus of the city of Vera Cruz, and in order to prevent the desertion of his soldiers, and to give them the courage of despair, he caused his little fleet to be destroyed. Cortes entered the city of Mexico 18 Nov. 1519. Montezuma, the sovereign of the country, received him as his master; and the inhabitants, it is said, thought him a god and a child of the sun. He destroyed the idols in the temples, to whom human sacrifices were offered, and placed in their room images of the Virgin and of the saints. In the meantime he made continual progress toward getting possession of the country, forming alliances with several caciques, enemies to Montezuma, and assuring himself of the others by force or stratagem. On a general of Montezuma attacking the Spaniards, in obedience to a secret order, Cortes repaired to the imperial palace, had the commander and his officers burned alive, and forced the emperor, while in chains, to acknowledge publicly the sovereignty of Charles V. The unhappy monarch added to this homage a present of a large quantity of pure gold, and a number of precious stones. But the jealousy of Velasquez was so much excited by the deeds of his representative, that he sent an army numbering about 1,400 against him. Cortes, with a force not more than 250 strong, advanced to meet it, gained over the soldiers who bore arms against him, and with their assistance again made war with the Mexicans, who had also revolted against their own emperor, Montezuma, whom they accused of treachery. After Montezuma, who had hoped to restore tranquillity by showing himself to the multitude, had fallen a victim to their rage, Guatimozin, his nephew and son-in-law, was acknowledged as emperor by the Mexicans, and gained some advantage over the Spaniards. He defended his capital during three months, but could not withstand the Spanish artillery. Cortes again took possession of Mexico, and in 1521 the emperor, the empress, the ministers, and the whole court were in his power. The unhappy Guatimozin was subjected to tortures

to make him disclose the place where his treasures were concealed, and was afterward executed with a great number of his nobles. The court of Madrid now became jealous of the power of Cortes, who had been some time before appointed captain-general and governor of Mexico. Commissioners were sent to inspect and control his measures; his property was seized, his dependents were imprisoned, and he required to Spain. He was received with much distinction, and returned to Mexico with an increase of titles, but a diminution of power. A viceroy had charge of the civil administration, and Cortes was entrusted only with the military command and the privilege of prosecuting his discoveries. The division of powers proved a constant source of dissension; and though he discovered the peninsula of California in 1533, most of his enterprises were frustrated, his life embittered, and he returned again to Spain, where he was coldly received and neglected. He followed Charles V. in his unfortunate expedition against Algiers in 1541 and gave signal proofs of his valor, yet the monarch continued to refuse him admission to the court. It is said that one day, having forced his way through a crowd round the carriage of his king, and put his foot on the step to obtain an audience Charles coldly inquired who he was. "I am a man," replied Cortes, "who has gained you more provinces than your father left you towns." He passed the remainder of his days in solitude, leaving a character eminent for bravery and ability, but infamous for perfidy and cruelty. Consult Prescott, 'Conquest of Mexico'; Helps, 'Life of Cortez' (1871).

Cortés, José Domingo, hō-sā' dō-mēn'gō, Chilean journalist and historical writer: b. about 1830; d. 1882. After some years spent in journalism he was for a time an attaché at Brussels, and subsequently a government director of libraries in Bolivia. He was a prolific author and among his works are: 'Diccionario biografico Americano'; 'Poetas Americanos'; 'Historia de Bolivia'; 'Estadistica bibliografia de Bolivia.'

Cortes, kôr'tēs, the old assembly of the "estates" in Spain and Portugal, the representatives chosen by the "estates" to assist in the making and administering of the laws of Spain and Portugal. In Spain the cortes of Castile, which was composed of the higher nobility, the superior ecclesiastics, the knights of the orders of St. James, Calatrava, and Alcantara, and the representatives of certain cities, held the first rank during the time of the united Spanish monarchy. In early times the king was very dependent upon them; indeed, they were invested with the power of making war, and frequently exercised it in opposition to the throne. In the original constitution of Aragon the form of government was very remarkable, a supreme judge, called *el justizia*, selected from persons of the second class, presided over the administration of the government. He decided all questions and disputes between the king and his subjects, and confined the royal power within the constitutional limits. King Ferdinand of Aragon and Isabella of Castile succeeded in rendering themselves independent of the "estates" (*las cortes*); and afterward, when the Castilians dared to resist an unconstitutional tax, at a meeting convoked at Toledo by Charles, in 1538, the king abolished this assembly of the "estates." After this neither the clergy nor nobility were assembled; deputies from 18 cities were sometimes, however, convened, but this only in case subsidies were to be granted. Philip II. restrained the liberties of the Aragonese in 1591. After the Spanish war of succession Philip V. deprived those provinces which had adhered to the Austrian party of the privileges that still remained to them. From that time the cortes were convened only to pay homage to the king or the Prince of Asturias, or when a question respecting the succession to the throne was to be determined. But when Napoleon attempted to extend his influence over Spain he convoked (15 June 1808) a junto of the cortes at Bayonne. In their last session, 7 June 1812, a new constitution was adopted by them. The ninth article regulated the powers and duties of the cortes, and provided that they should consist of 25 archbishops, 25 nobles, and 122 representatives of the people. Napoleon afterward attempted, by offering to restore the cortes to their ancient importance, to gain over the Spanish nobility, and through them the people, but failed. The Portuguese cortes is coeval with the monarchy. In 1143 the assembly at Lamego was asked to confirm the elevation of Alphonso I. to the throne, and replied: "We resolve that he shall be king during his life, and his children after him." The general prosperity of the country made the people less interested in the cortes, their representatives; and the kings, elated with success, paid no attention to them only when in need of money. In the year 1828 Don Miguel assembled the cortes, in order to be acknowledged by them, and to give his usurpation an appearance of legitimacy. See PORTUGAL; SPAIN.

Cor'tex, that portion of an organ usually situated on the outside. Thus the cortex of the brain is the external gray portion in which most of the nerve cells are located.

Corthell, Elmer Lawrence, American engineer: b. South Abington, Mass., 30 Sept. 1840. He served in the First Rhode Island Light Artillery, rising to the rank of captain 1861–5. Returning to Brown University he graduated in 1867, adopted the engineering profession, and has had charge of or been connected with many important engineering undertakings. As an assistant under Capt. James B. Eads he built various bridges and levees along the Mississippi River. He was chief engineer of the Southern Bridge and Railway Company, building a railroad over the Mississippi River at New Orleans; consulting engineer to the Illinois Central R.R., and Atchison, Topeka & Santa Fe R.R. 1890–3; and consulting engineer to the Argentine government 1900. His publications include: 'History of the Jetties at the Mouth of the Mississippi' (1880); 'The Interoceanic Problem and Its Scientific Solution' (1885); 'An Enlarged Waterway Between the Great Lakes and the Atlantic Seaboard' (1901), etc., and the articles on jetties, levees, ship canals, and ship railways in Johnson's 'Universal Cyclopædia.'

Cortina, Juan Nepomucena, hoo-än' nā-pō-moo-chā'na kôr-tē'nä, Mexican adventurer: b. 1830. He took an active part in the Mexican war, organizing a band of independent guerrillas, which later became a part of the national army, and with their commander took part in many of the battles of that contest.

After the war he became a general in some of the revolutionary risings, and in 1859 set himself up as an independent ruler along the border line between the United States and Mexico, where he held sway from 1859 until 1863. He became an adherent of the unfortunate Maximilian, and after his execution again joined the national party, and received high office from President Juarez. In 1876 he was arrested and Gen. Diaz ordered his execution, but he was shut up in a military prison instead. No record of his death appears.

Cor'tissoz, Ellen Mackay Hutchinson, American journalist and author: b. New York. She is on the literary staff of the New York *Tribune,* with which her husband, Royal Cortissoz, is also connected as a literary and art editor. She is the author of 'Songs and Lyrics' (1881), and with E. C. Stedman edited the 'Library of American Literature' (11 vols. 1888–94).

Cort'land, N. Y., city, county-seat of Cortland County; situated on the Tioughnioga River; and the Lackawanna, the Lehigh Valley, and the Erie R.R.'s; about 38 miles northwest of Binghamton. It is a farming and manufacturing trade centre, and has several wire-works, foundries, machine shops, and manufactories of carriages, stoves, harness, furniture, cash registers, and steel ware; has electric lights and railways, several churches, a State Normal school, daily and weekly newspapers, and three national banks. Pop. (1902) 11,061.

Cortona, Pietro di, pē-ā'trō dē kōr tō nä, properly **Pietro Berretini,** Italian painter and architect: b. Cortona 1 Nov. 1596; d. Rome 16 May 1669. Pope Urban VIII. employed him to decorate a chapel in the Church of St. Bibiena, and also to execute the frescoes of the grand salon of the Barberini Palace. Many churches of Rome were decorated by him; and at Florence he adorned the Pitti Palace for the Grand Duke Ferdinand II. His easel pictures, although of less value than his larger works, are held in great estimation. As an architect he did some important work in church restoration.

Cortona, Italy, city in the province of Arezzo, northwest of Lake Trasimeno, about 50 miles southeast of Florence. It is one of the oldest cities in Italy, and has, in a good state of preservation, a number of the old Roman buildings. Chief of its attractions now are the cathedral, a museum of Etruscan antiquities, and portions of the old Etruscan wall. Pop. commune (1902) 29,412.

Corumbá, kō-room-bä', Brazil, a town of the state of Matto Grosso. It is situated on the Paraguay River, near the Bolivian border, and has the largest trade of any place in the state. The receipts at its custom-house for 1902 were 1,242,541 milreis. The principal products of Matto Grosso, maté, cattle, beef, hides, skins, rubber, etc., are shipped from this point. Here also is located the important arsenal of Ladario. Pop. 7,000.

Coruña, kō-roo'ña, La, a seaport of Spain, in the province of the same name in Galicia, on the northwest coast, on a peninsula at the entrance of the Bay of Coruña. It consists of an upper and a lower town, the former built on the eastern side of a small peninsula, and the latter on the isthmus connecting the peninsula with the mainland. The harbor, which is well protected, is deep, spacious, and safe, and many improvements have lately been made. Cattle form the chief export. The imports are nearly twice as great as the exports. There is a large government tobacco factory. There is a lighthouse 92 feet high, called the Tower of Hercules, and supposed to be of Carthaginian construction and to have been remodeled in Trajan's time. The city was founded by the Carthaginians or other Semitic colonists and under Roman rule received the name Caronium. Coruña was the port of departure of the Spanish Armada (1588), and the scene of the repulse of the French and the death of Sir John Moore (1809). Pop. 41,000. The province of La Coruña contains another excellent harbor especially adapted for a naval station, namely Ferrol. It has many mineral springs which have been little exploited. The sea-fisheries are the prime industry. Pop. 631,000.

Corun'dum, or **Adamantine Spar,** a native oxide of aluminum, Al_2O_3, crystallizing in the rhombohedral system, and also occurring massive. Its hardness is 9, and its specific gravity about 4. It is adamantine or vitreous in luster, and very variable in color. Three varieties are commonly recognized. Of these the first is known as sapphire, and includes those specimens that are used as gems (q.v.). The typical sapphire (q.v.) is blue, the red kind being known as "oriental ruby," the yellow as "oriental topaz," the green as "oriental emerald," and the purple or violet as "oriental amethyst." The colors of these gems are due to the presence of traces of certain metallic oxides. The second principal variety of the mineral is that which is known in the arts simply as "corundum," and is used as an abrasive (q.v.). It includes the less transparent varieties of blue, brown, black, gray or white colors. It is either crystallized or granular, or in masses showing distinct parting. The third variety, "emery," is not pure, but is an intimate mixture of corundum with magnetite or hematite. It has long been one of the most important abrasives (q.v.), but it is now being superseded by the greatly superior pure corundum. This usually occurs in crystalline rocks such as granite, gneiss, nepheline-syenite, granular limestone, also chlorite and mica-slate. Sapphire and ruby (qq.v.) are usually in alluvial deposits and in the beds of rivers. The Canadian corundum deposits, discovered a few years ago, are the largest and most important known. Corundum is also found in many other localities, notably in North Carolina, Georgia, Montana, and India.

Cor'us, Chomer, Homer, or **Omer,** a Jewish measure containing, as a liquid measure, 10 baths, or 75 gallons and 5 pints; and as a dry measure, 10 ephahs, or 32 pecks and 1 pint. It was most commonly employed as a dry measure, and was the largest in use among the Jews. Corus is the term generally met with in the historical books of the Bible, and omer or chomer that which is oftenest found in the prophetical ones. Corus is used by some old English writers for 8 bushels, or one quarter.

Corvallis, kôr-văl'lĭs, Ore., a town and county-seat of Benton County, situated in the western part of the State on the Willamette River and on the Southern Pacific and the

Oregon Central & Eastern railroads. It also has steamboat service for two thirds of the year, and as the centre of an agricultural district, has considerable export trade, particularly in wheat. It has saw-mills, planing-mills, a carriage factory, flour mills, and other manufacturing industries. It is the seat of the State Agricultural College. Pop. (1900) 1,819.

Corvée, kôr-vā (Fr., from Lat. *cura viæ*, 'care of the road'), the obligation of the inhabitants of a certain district to do certain labor for the feudal lord or the sovereign gratis or for pay. *Corvée* originally meant compulsory labor on roads, bridges, etc., but it is applied also to other feudal services. In some parts of Germany they still exist. In Prussia they were abolished under Hardenberg's administration. In France the first revolution extirpated this relic of the feudal times.

Corvette, kôr-vĕt', a term applied to a flush-deck vessel, ship- or bark-rigged, having only one tier of guns, usually not more than 20, either on the upper or main deck, ranking between a brig and a frigate. The term is no longer used.

Corvey, kôr'vī, or **Korvei**, a formerly renowned Benedictine abbey near Höxter in the Prussian province of Westphalia, founded in 816; an early centre of German civilization. Wittekind, the historiographer of the convent, Bruno, known afterward as Pope Gregory IV., and many other learned men, were educated here. To its library belonged the only manuscripts of the first six books of the 'Annals of Tacitus' discovered here in 1514. In the first quarter of the 19th century Corvey passed in quick succession into the possession of the House of Orange, of Westphalia, of Prussia, and of the Duke of Ratibor, to whom it now belongs. The abbey or castle of Corvey, as it is now called, has a rich and extensive library; but the ancient collection of the Benedictines is no longer in existence.

Corvidæ, kôr'vĭ-dē, a family of passerine birds containing the crows and their allies, closely related to the blackbirds (*Icteridæ*), starlings (*Sturnidæ*) and larks (*Alaudidæ*). The bill is strong, more or less compressed; the upper mandible to a certain extent curved, the tip notched; the nostrils are covered with stiff bristle-like feathers pointing forward; there are 12 retrices in the tail and 10 primary wing feathers. Most ornithologists now recognize three sub-family divisions, the *Fregilinæ* or choughs, the *Garrulinæ*, or jays and magpies, and the *Corvinæ*, or crows, of which the last two are represented in North America by numerous species. About 150 species, dstributed in upward of 35 genera, are found in all parts of the world except a few islands of the south Pacific region. *Callæas* and its allies of the New Zealand islands are sometimes included as a fourth sub-family.

Corvinus, kôr-vī'nŭs, Matthias. See MATTHIAS I., CORVINUS.

Corvus, Marcus Valerius, Roman general: b. about 371 B.C.; d. about 270 B.C. He distinguished himself in the first Samnite war, and according to the legends, was assisted in killing a gigantic Gaul in single combat by a raven, which picked out the eyes of his antagonist.

Corwin, Edward Tanjore, American clergyman: b. New York 12 July 1834. He graduated at the College of the City of New York (1853), and at the New Brunswick, N. J., Theological Seminary of the Reformed Dutch Church. He held New Jersey pastorates at Paramus 1857–63, and Millstone 1863–88, when he became rector of Hertzog Hall, New Brunswick. He has published: 'Manual and Record of the Church of Paramus' (1858); 'Manual of the Reformed Protestant Dutch Church in North America' (1859); 'The Millstone Centennial' (1866); 'The Corwin Genealogy in the United States' (1872), etc.

Corwin, Thomas, American statesman and orator: b. Bourbon County, Ky., 29 July 1794; d. Washington, D. C., 18 Dec. 1865. He was admitted to the bar at Lebanon, Ohio, in 1817, and elected to the Ohio legislature in 1821. He became a member of Congress in 1831; was governor of Ohio 1840–2; United States senator 1845–50; secretary of the treasury 1850–3; member of Congress 1859–61, and United States minister to Mexico 1861–4. He was an eloquent orator and one of his most famous speeches was delivered in the Senate 11 Feb. 1847, in opposition to the Mexican war.

Cory, Charles Barney, American naturalist: b. Boston, Mass., 31 Jan. 1857. He is a director in many important corporations, but best and most widely known as an expert vertebrate zoologist. He is an honorary curator of the Field Columbian Museum, Chicago, and a Fellow of the Linnæan and Zoological societies of London, England. His published works include: 'A Naturalist in the Magdalen Islands' (1878); 'Birds of the Bahama Islands' (1880); 'Southern Rambles: Florida' (1881); 'The Beautiful and Curious Birds of the World' (1883); 'Birds of Haiti and San Domingo' (1884–6); 'Birds of Eastern North America'; 'How to Know the Ducks, Geese, and Swans of North America'; 'How to Know the Shore Birds of North America'; 'The Birds of the West Indies'; 'Key to the Water Birds of Florida'; 'Key to the Birds of Eastern North America'; 'Hunting and Fishing in Florida'; 'Montezuma's Castle, and other Weird Tales' (1890); 'Dr. Wandermann.'

Coryat, kôr'yat, Thomas, English traveler: b. Odcombe, Somerset, 1577; d. Surat, India, December 1617. He published in 1611 some of his traveling experiences, 'Coryat's Crudities,' etc., a curious book, to which quizzical verses in various ancient and modern languages, written by Ben Jonson, Donne, and other authors, are appended. The latter were afterward published separately under the title of 'Odcombian Banquet,' with an advertisement reflecting satirically upon Coryat, who was a butt of the wits with whom he associated in London. In a second volume, however, entitled 'Cramb, or Colwort Twice Sodden,' published the same year, he protested that the verses were appended to the former without his consent. In his first journey, which occupied five months in 1608, he traveled nearly 2,000 miles in Europe, about one half of which distance he walked. He departed on his second journey in 1612, explored the Levant, resided for a time at Constantinople, examined the vestiges of Troy, visited as many of the sites of the seven churches of Asia Minor

as he could discover, and reached India with the intention of proceeding thence through China, the plains of Tartary, and Ethiopia, and of "casting his eyes upon many other places."

Corybantes, kôr-ĭ-băn'tēz, beings mentioned in Greek mythology which were said to have sprung from Corybas, son of Cybele and Iasion, who appointed them to perform religious service for his mother, the goddess Cybele, in Crete and Phrygia. They engaged in wild religious dances to the accompaniment of the music of flutes, cymbals, etc. There were also Corybantes who were regarded as a class of deities resembling the Cabeiri, and of whom little is known. According to ancient traditions, they were descendants of Hephæstus (Vulcan). The name is sometimes given to the priests of Cybele, as it was said they imitated the dance of the Corybantes.

Corydalis, or **Alder-fly,** one of our largest insects, whose net-veined wings expand nearly six inches. It is a member of the neuropterous family *Sialidæ,* and is named *Corydalis cornutus* in allusion to the enormously long horn-like mandibles of the male, those of the female being large, but short, broad and toothed. The larva is called in the northern States hellgramite, and among the Mississippi fishermen it is known as crawler; it is much esteemed as bait. The larva lives under stones in brooks; is nearly three inches long, with six legs and big jaws, and along each side of the hind-body is a series of long filamentary appendages, at the base of which are short bushy or spongy gills. It breathes by the spiracles during its later larval life, when it lives out of the water. It transforms into a chrysalis in the earth on the banks of brooks. The female lays from 2,000 to 3,000 eggs in a mass. Though very ferocious in appearance, the insect, which sometimes alights on one's dress, is entirely harmless.

Corydalis, kŏ-rĭd'ă-lĭs, a genus of plants of the fumitory family (*Fumariaceæ*). The name is also applied to some species of the poppy family. See FUMITORY.

Corydon, kŏr'ĭ-dŭn, Ind., a town and the county-seat of Harrison County, situated in the southeastern part of the State on Indian Creek, and on the Louisville, N. A. & C. R.R. It has several manufacturing establishments, including a furniture factory. It has a sulphur spring and is a summer resort. It was the capital of the Territory, and of the State till 1824. Pop. (1900) 1,610.

Corydon, Iowa, a town and the county-seat of Wayne County, situated in the southern part of the State, 60 miles south of Des Moines, on the Keokuk & Western Railroad. Pop. (1900) 1,477.

Cor'ymb, in botany, a form of indefinite inflorescence, in which the flower-stalks, though springing from different parts of the main axis, have their lengths such that their tops form a flat or nearly flat surface. Examples are meadow-sweet, hawthorn, candytuft, etc.

Corym'bus, in ancient sculpture, the wreath of ivy-leaves, berries, or garlands with which vases were encircled. The term is also applied to that style of dressing the hair among the Grecian women, in which it was tied in a knot on the top of the head.

Coryphæna, kôr-ĭ-fē'nạ, a genus of fishes of the mackerel family (*Scombcridæ*). The body is elongated, compressed, and covered with small scales, and the dorsal fin extends the whole length of the back, or nearly so. The dolphin of the ancients is the *C. hippuris.* All the species, natives of the seas of warm climates, are very rapid in their motions, and very voracious. They are of brilliant colors and are objects of admiration to every voyager.

Coryphæus, kôr-ĭ-fē'ŭs, the leader of the chorus in the ancient dramas. His functions, however, were often as wide as those of our stage-manager, conductor, and ballet-master. The name is now applied to the leaders of the different parts in operatic choruses, or the principal dancers in the *corps de ballet.* By extension it is also applied to those eminent in the arts or sciences.

Coryphodon, kō-rĭf'ō-dŏn, a fossil ungulate of the extinct order *Amblypoda* (q.v.), found in the Lower Eocene sediments of Europe and America. The feet were short and post-like, somewhat like those of elephants, while the head resembled rather that of a hippopotamus with large flaring front teeth covered by a broad fleshy muzzle, and the skeleton had many archaic and peculiar characters. The coryphodon was the largest land animal of its time, intermediate in size between the tapir and rhinoceros. A mounted skeleton has been erected in the American Museum of Natural History, New York.

Cory'za (Gr. κόρυζα, "catarrh"), a cold in the head. See COLD.

Cos, kŏs, an island belonging to Turkey; situated off the coast of Asia Minor, in the Ægean Sea; length about 25 miles; area about 95,000 square miles. It is noted as the birthplace of Hippocrates and Ptolemy II., surnamed Philadelphus, and it claims the honor of being the birthplace of the Greek artist, Apelles. The surface rises partly into rugged hills, but a considerable portion is fertile and well cultivated, yielding grapes, oranges, olives, pomegranates, etc. The modern town of Cos is well built, and contains a large quadrangular fortress erected by the Knights of Rhodes in the 14th century. The harbor is now so filled up that only small vessels can enter. In Cos was manufactured a fine, semi-transparent kind of silk, much valued by the ancients. Pop. about 25,000.

Coscinomancy, kŏs'ĭ-nō-măn-sĭ, or **Coskinomancy,** a kind of divination effected by means of a sieve, which was either suspended or fixed on the point of a pair of shears. The diviner then uttered a certain formula, and repeated the names of any persons suspected of a crime. If the sieve moved at the mention of any name, that person was considered guilty.

Coseguina, kō-sē-gwē'nä, a volcano in the western part of Nicaragua on a peninsula south of the Gulf of Fonseca. The mountain is cone-shaped and 4,000 feet high. It is remarkable on account of the eruption of 1835, beginning 20 January and lasting three days. The country within 100 miles was darkened by the cloud of ashes, and ashes were carried as far as Jamaica and Mexico. The volcano is now quiescent.

Co'sel, Charlotte von. See ACER, ADELHEID VON.

Coseley, kōz'li, England, town in Staffordshire, near Wolverhampton, eight miles northwest of Birmingham. There are iron foundries, nail, hook, chain, and screw works, stove-grate manufactories, cement works, melting establishments, and brick-fields. There are extensive iron and coal mines in the district. Pop. (1901) 22,218.

Cosenza, kō-sent'sä (anciently, COSENTIA), Italy, city of the southern part, capital of the province of Cosenza (Calabria Citeriore), situated on seven small hills, at the foot of the Apennines, where the Busento joins the Crati, 150 miles southeast of Naples. The metropolitan is the only church within the walls; but there are three parish churches in the suburbs. It contains one technical school, two academies of science and fine arts, and one college. The environs are beautiful, populous, and well cultivated, producing abundance of corn, fruit, oil, wine, and silk. This town was anciently the capital of the Bruttii, and a place of consequence in the second Punic war. Cosenza has frequently suffered from earthquakes, particularly in the years 1638, 1783, 1854, and 1870. Pop. (1900) 20,000.

Cos'grove, Henry, American Roman Catholic prelate, b. Williamsport, Pa., 1834. He was ordained priest in 1857, was pastor of a Davenport (Ia.) church in 1862, vicar-general in 1882, and bishop of Davenport in 1884.

Coshocton, Ohio, city and county-seat of Coshocton County, situated on the Muskingum River, on the Ohio Canal, and on the Pennsylvania, the Toledo, W. V. & O. and the Wheeling & L. E. R.R.'s; 69 miles northeast of Columbus. The city has four large advertising and sign manufactories employing about 1,000 hands, machine-shops, iron and steel works, and a paper-mill. There is an abundant supply of coal nearby, the mines affording employment to 300 persons. There are three banks, with a combined capital of $225,000. The educational system consists of four public schools and an excellent public library. For religious worship there are 10 church edifices. Coshocton was first settled in 1801 by Charles Williams and Isaac Hoagland, became a borough in 1848, and a city in 1902. Municipal affairs are administered by a mayor and council of seven members, elected biennially. The city owns and operates its waterworks. The inhabitants are mainly American born. Pop. (1890) 3,672; (1900) 6,473.

C. B. MCCOY,
Editor of 'Age.'

Cosmas, kŏs'mās, surnamed INDICOPLEUSTES, Alexandrian merchant of the 6th century. After having traveled much he returned to Egypt, where in monastic retirement he wrote in Greek a work of greater interest than value, on 'Christian Topography,' extending to countries as far as India. The work is included by Montfaucon in the 'New Collection of the Greek Fathers' (Vol. II. 1706).

Cosmati (kŏs-mä'tē) **Family,** a family of architects and sculptors who flourished in Rome from the last half of the 12th century to the beginning of the 14th. The more prominent members of the family were Lorenzo, Cosma, Luca, Jacopo, and Giovanni. They won their fame by their decorative architectural work, known as Cosmati or Roman work, distinguished by the use of mosaic and colored marbles. Among their best works are the entrance to the cathedral of Civita Castellana, the cloisters of the Lateran, and the abbey-house of Saint Paul.

Cosmetics (Gr. κοσμητικός, from κοσμεῖν, 'to decorate'), means for preserving or increasing the beauty of the human body. Such means are used by the most savage as well as the most civilized nations. Some tribes smear their bodies with butter, and the use of oil as a cosmetic is mentioned in the 104th Psalm, — "oil to make [man's] face to shine." The use of cosmetics is hardly to be compared with the painting of the face or body by savages in order to make them look ferocious or terrifying to an enemy. Cosmetics are rather intended to soften and beautify the features, and to act by assimilation; but this assimilation, while it may for a short while achieve the result desired, usually produces disastrous after-effects. The substances used clog the pores of the skin and arrest the perspiration, both sensible and insensible, which is so necessary to health. This check to the perspiration may lead to re-absorption into the system of those very waste and injurious matters which the skin-pores are designed to carry off. The pores may also be enlarged, resulting in a coarsening of the skin that will prove very disfiguring in after-life. Certain preparations are positively and almost immediately dangerous, as, for example, the so-called pearl powder, which is a compound of bismuth. When this is absorbed into the system, it is certain, sooner or later, to show its influence on the nervous organization by a partial paralysis of the eyelids or of the corners of the mouth. It has, further, the disagreeable inconvenience of being liable to change its color upon the skin to black, should it be exposed to any gas containing sulphuretted hydrogen; and if this should reach but one side of the face a most striking contrast would be developed in the appearance of the two cheeks. Even the eating of onions or inhaling their perfume will cause this cosmetic to change into black hydrosulphuret of bismuth. The ravages caused by the use of cosmetics are illustrated in the great numbers of manifestly not aged women who throng city streets, with a wealth of crows' feet and other wrinkles that would not be attained by women of double their age who trusted to bathing, out-door exercise, temperate living, and pure air to preserve their skins in good condition. If, by reason of a positive disfigurement or a disordered condition of the skin, it is thought advisable to use some kind of medicament, the only safe method to pursue is to consult a reliable physician and follow his advice, rather than to go to the charlatans who acquire fortunes at the expense of their vain dupes by selling compounds worth but a few cents at a price that will return a profit of as many dollars. Among the articles used in their preparations are lead, mercury, bismuth, antimony, and arsenic,— all active poisons.

Cosmic Dust, very finely divided matter precipitated upon or attracted to the earth from extra-terrestrial space. It has been found on snow-fields in high latitudes and in the ooze of deep ocean valleys. Scientists have expressed doubts as to its true origin, and certainly a large amount of the fine dust floating in the

terrestrial atmosphere is nothing but extremely fine volcanic ash. At the time of the great explosion of Krakatoa in 1883 an enormous quantity of this ash was thrown into the air, the height which it attained being estimated at over 15 miles. A similar phenomenon was observed at the time of the eruption of Mont Pelée, in Martinique, in 1902, when the ashy dust fell on the decks of ships many hundred miles from its source.

Cosmogony (Gr. *κόσμος*, "world," + *γωνή* "origin"), according to its etymology, should be defined the origin of the world itself; but the term has become, to a great degree, associated with the numerous theories of different nations and individuals respecting this event. Though the origin of the world must necessarily remain forever concealed from human eyes, there is, notwithstanding, a strong desire in the breasts of mortals to unveil it; so that we find hypotheses among all nations respecting the beginning of all things. We may divide these hypotheses into three classes: (1) The first represents the world as eternal, in form as well as substance. (2) The matter of the world is eternal, but not its form. (3) The world had a beginning, and shall have an end.

1. Ocellus Lucanus is one of the most ancient philosophers who supposed the world to have existed from eternity. Aristotle appears to have embraced the same doctrine. His theory is, that not only the heaven and earth, but also animate and inanimate beings, in general, are without beginning. His opinion rested on the belief that the universe was necessarily the eternal effect of a cause equally eternal, such as the Divine Spirit, which, being at once power and action, could not remain idle. Yet he admitted that a spiritual substance was the cause of the universe; of its motion and its form. He says positively, in his 'Metaphysics,' that God is an intelligent Spirit (*νοῦς*), incorporeal, eternal, immovable, indivisible, and the Mover of all things. According to this great philosopher the universe is less a creation than an emanation of the Deity. Plato says the universe is an eternal image of the immutable idea, or type, united from eternity with changeable matter. The followers of this philosopher both developed and distorted this idea. Ammonius, a disciple of Proclus, taught in the 6th century, at Alexandria, the coeternity of God and the universe. Modern philosophers, and also ancient ones (for example, Xenophanes, according to Diogenes Laertius), went further, and taught that the universe is one with the Deity. Parmenides, Melissus, Zeno of Elea, and the Megaric sect, followed this doctrine.

2. The theory which considers the matter of the universe eternal, but not its form, was the prevailing one among the ancients, who, starting from the principle that nothing could be made out of nothing, could not admit the creation of matter, yet did not believe that the world had been always in its present state. The prior state of the world, subject to a constant succession of uncertain movements which chance afterward made regular, they called *chaos* '*χάος*, "empty space"). The Phœnicians, Babylonians, and Egyptians seem to have adhered to this theory. The ancient poets, who have handed down to us the old mythological traditions, represent the universe as springing from chaos without the assistance of the Deity. Hesiod feigns that Chaos was the parent of Erebus and Night, from whose union sprang the Air (*αἰθήρ*, "the upper air," as distinguished from *ἀήρ*, "the lower air"), and the Day (*ἡμέρα*). He further relates how the sky and the stars were separated from the earth, etc. The system of atoms is much more famous. Leucippus and Democritus of Abdera were its inventors. The atoms, or indivisible particles, say they, existed from eternity, moving at hazard, and producing, by their constant meeting, a variety of substances. After having given rise to an immense variety of combinations, they produced the present organization of bodies. This system of cosmogony was that of Epicurus, as described by Lucretius. Democritus attributed to atoms form and size, Epicurus added weight. Many other systems have existed which must be classed under this division. That of the Stoics admitted two principles, God and matter, in the abstract, both corporeal, for they did not admit spiritual beings. The first was active, the second passive.

3. The third theory of cosmogony makes God the creator of the world out of nothing. This is the doctrine of the Mosaic cosmogony as contained in the first chapter of the book of Genesis, which gives a somewhat detailed account, including the creation of the heaven and the earth, and various subsequent creative acts, culminating in that of man. The immediate creation of heaven and earth by God is also emphatically asserted in some of the psalms. This has been the cosmogony most commonly accepted by Christians, though many at the present day do not consider that they are bound to accept it as literally true. Some consider it to have been derived by the Jews from some non-Jewish people, and a creation story in some respects similar has been discovered among the old Babylonian cuneiform inscriptions. Similar views were also held by the Etruscans and Persians.

Older speculators on the origin of the world had a simpler problem before them than have the modern, now that science has so greatly advanced; difficult questions regarding the origin of life and the evolution of plants and animals have made themselves felt; and the revelations of astronomy have so greatly enlarged our conceptions of the universe. Of the origin of our own globe several hypotheses have been put forward, perhaps the most common being the nebular hypothesis (q.v.).

Cosmorama, kŏz-mō-rä'ma, a species of picturesque exhibition, consisting of 8 or 10 colored drawings, executed in body colors, laid horizontally around a semicircular table, and reflected in mirrors placed diagonally opposite to them. The spectator looks at them through convex lenses placed immediately in front of each mirror. The exhibition takes place by lamplight only, and the lamps are so placed as not to be reflected in the fields of the mirror. There is nothing new in the invention, and the views exhibited are generally copies made from engraved views, such as those of Piranesi, De Nou, Le Bruyer, and other artists.

Cos'mos, about 20 species of annual and perennial herbs of the natural order *Compositæ*. They are natives mostly of Mexico, whence several have been introduced into gardens for their bright flower-heads, which appear in late sum-

mer and during the autumn. They are rather tall plants with opposite pinnate, entire, or lobed leaves, and typically, red or purple flowers (yellow in one species), but in horticultural varieties white and other colors. Their long flower-stems make the plants useful for bouquets. Cosmos is especially popular in the United States because it is easily grown from seeds started in hotbeds, and because it thrives upon almost any garden soil and with the most ordinary care. The cultivated forms are derived mostly from *C. sulphureus* and *C. bipinnatus*, the former of which often exceeds eight feet in height, the latter rarely more than four feet. The flowers are often more than two and a half inches in diameter. *C. diversifolius*, sometimes called black cosmos, is widely known as a *Dahlia*, or a *Bidens*, and seems to be upon the border line between these genera. Probably no plant introduced into ornamental cultivation during the closing years of the 19th century offers such possibilities of improvement as cosmos. Since 1885, when there were few distinct varieties, so much improvement has been wrought that plant breeders are very hopeful. Comparing the typical species of chrysanthemum with its improved varieties will give an idea of what may possibly be accomplished with cosmos.

Cos'mos, kŏz'mŏs (Gr. *κόσμος*, "order" or "harmony"), the universe as an orderly and beautiful system. In this sense it has been adopted by Humboldt as the title of his celebrated work, which describes the nature of the heavens as well as the physical phenomena of the earth.

Cosor'yx, a genus of antelope-deer (see RUMINANTS, FOSSIL) allied to *Merycodus* (q.v.), but with antlers of two equal tines. It is found fossil in the Miocene bad lands of the western United States, and is thought to be ancestral to the modern pronghorn antelope.

Cossa, Francesco, frän-chĕs'kō kŏs'sä, Italian painter: fl. 1470. He lived at first in Ferrara, and is considered one of the founders of the Ferrarese School of Painting; after 1470 he lived in Bologna. His works include: 'Madonna with Saints' (at Bologna), and frescoes in the Schifanoja palace at Ferrara.

Cossa, Pietro, pē-ā'trō, Italian dramatist: b. Rome 25 Jan. 1830; d. Livorno 30 Aug. 1881. He was for some years professor of Italian literature. At first an unsuccessful dramatist, his 'Nero' (1871) was received with the most enthusiastic approval for its dramatic power, despite certain marked technical defects of composition. His following plays confirmed the popular estimate of his powers: 'Messalina,' 'Julian the Apostate,' and especially 'Cleopatra.' He wrote also a volume of 'Lyric Poems.'

Cossacks, kŏs'ăks, tribes who inhabit the southern and eastern parts of Russia, paying no taxes, but performing instead the duty of soldiers. Nearly all of them belong to the Græco-Roman Church, to which they are strongly attached, and to the observances of which they are particularly attentive. They must be divided into two principal classes, both on account of their descent and their present condition — the Cossacks of Little Russia and those of the Don. Both classes, and especially those of the Don, have collateral branches, distributed as Cossacks of the Azov, of the Danube, of the Black Sea, of the Caucasus, of the Ural, of Orenburg, of Siberia, of the Chinese frontiers, and of Astrakhan. Writers are not agreed as to the origin of this people and of their name, but they are believed to be a mixed Caucasian and Tartar race. In personal appearance the Cossacks bear a close resemblance to the Russians, but are of a more slender make, and have features which are decidedly more handsome and expressive.

Originally their government formed a kind of democracy, at the head of which was a chief or hetman of their own choice; while under him was a long series of officers with jurisdictions of greater or less extent, partly civil and partly military, all so arranged as to be able on any emergency to furnish the largest military array on the shortest notice. The democratic part of the constitution has gradually disappeared under Russian domination. The title of chief hetman is now vested in the heir-apparent to the throne, and all the subordinate hetmans and other officers are appointed by the crown. Care, however, has been taken not to interfere with any arrangements which foster the military spirit of the Cossacks. Each Cossack is liable to military service from the age of 18 to 50, and is obliged to furnish his own horse. They furnish the empire with one of the most valuable elements in its national army, forming a first-class irregular cavalry, and rendering excellent service as scouts and skirmishers. In 1570 they built their principal "stanitza" and rendezvous, called Tcherkask, on the Don, not far above its mouth. As it was rendered unhealthful by the overflowing of the island on which it stood, New Tcherkask was founded in 1805 some miles from the old city, to which nearly all the inhabitants removed. This forms the capital of the country of the Don Cossacks, which constitutes a government of Russia, and has an area of 61,900 square miles, and a population of 1,474,133. It has a military organization of its own.

Cossacks, The, a story by Tolstoi, published 1852. This Russian romance is a series of picturesque studies on the life of the Cossacks of the Terek, rather than a romance. The story is particularly interesting as showing the first germs of the altruistic philosophy which Count Tolstoi has developed into a vigorous system of self-renunciation.

Cossé, Charles de, shärl dė kŏs-sā, COMTE DE BRISSAC, French marshal: b. Anjou about 1505; d. Paris 31 Dec. 1563. He served with success in the Neapolitan and Piedmontese wars and distinguished himself as colonel in the battle of Perpignan in 1541. He rose to the rank of grandmaster of artillery of France; and subsequently obtained the office of governor of Piedmont, and the baton of marshal of France in 1550. He afterward returned to France as governor of Picardy, and rendered that province important services.

Costa, kŏs'tä, **Isaac da,** Dutch poet and theologian: b. Amsterdam 14 Jan. 1798; d. 28 April 1860. He was called to the Institute of Amsterdam in 1840, and soon acquired a high reputation both for his poetic and theological works. Poetry he continued to write up till 1857, when his last poem, the 'Battle of Nieuwpoort,' was published. Among his theological works are: a 'Refutation of Strauss' Life of Jesus'; a 'History of the Destinies of the Peo-

ple of Israel' (translated into English and German); 'Considerations on the Spirit of the Age.'

Costa, Lorenzo, lō-rĕnt'sō kōs'tä, Italian painter: b. Ferrara about 1460; d. Mantua 5 March 1535. He was employed to decorate the choir of the Church of San Domenico in Ferrara, and was invited to the ducal court, where he painted a number of portraits of princes and nobles. Shortly afterward we find him at Ravenna, at Bologna, where he executed a 'St. Sebastian Pierced by Arrows,' a 'Virgin,' a 'Saint James,' a 'Saint Jerome,' etc. At Mantua, whither he was invited by Francesco Gonzaga, he painted the greater number of the pictures in the palace, then being restored by that prince. He left behind him a reputation for keenness of observation, correctness in design, and great simplicity and grandeur in form, together with harmonious grouping.

Costa, Sir **Michael,** English musical composer and conductor: b. Naples 4 Feb. 1810; d. Brighton, England, 29 April 1884. He studied at the Naples Royal Academy of Music, where he showed great proficiency. In 1829 he went to England, and in 1839 became a naturalized British subject. He was conductor of the Philharmonic Society, the Sacred Harmonic Society, Her Majesty's Opera, the Handel Festivals, etc. His chief works are the opera, 'Don Carlos' (1844) and the oratorios, 'Eli' (1855); and 'Naaman' (1864), the two last having been composed for the Birmingham Festival. He composed additional accompaniments for several of Handel's oratorios. He was knighted in 1869.

Costa-Cabral, Antonio Bernardo da, än-tō'-nē-ō bĕr-närd'dō dä kōs'tä kä-bräl', Count of Thomar, Portuguese statesman: b. Fornas d' Algostra, province of Beira, 9 May 1803; d. San Juan de Flor 1 Sept. 1889. He received his education at the University of Coimbra, became prime minister 7 March 1838, but relinquished this position two months afterward. In 1841, however, he was reinstated. His oppression and misgovernment resulted in his being driven from power 17 May 1846. In 1849, however, he was reappointed prime minister, but only to inaugurate a still more stringent dictatorship. Impoverishing the people by his unscrupulous system of expenditure, contracting new loans, and imposing new taxes, the outcry against him became so irresistible that his own brother Sylva, a member of his cabinet as minister of justice, would not any longer serve under him, and became leader of the opposition in the Cortes, which body was now determined on his overthrow. In the meantime, however, Saldanha set on foot a revolution at Cintra, which spread rapidly over the whole kingdom, and put an end to Costa-Cabral's administration 26 Feb. 1851. Saldanha became prime minister of Portugal, and Costa-Cabral fled to England. He was ambassador to Brazil 1859–61.

Costa Rica, a republic of Central America, bounded by Nicaraugua, the Caribbean Sea, Colombia, and the Pacific Ocean; area about 22,000 square miles.

Political Divisions.— The republic is divided into five provinces and two comarcas. Both provinces and comarcas are subdivided into cantones, and the cantones into districts. Each canton has a municipal organization elected by the people; but the political chiefs of the cantones and the governors of the provinces and comarcas are appointed by the president of the republic. The provinces are: San José, Alajuela, Cartago, Heredia, and Guanacaste. The comarcas are: Puntarenas (sometimes written Punta Arenas) and Limón.

Mountains and Forests.— The mountains do not form a continuous chain, but are divided into two main groups, that of the northwest and that of the southeast, the former including the volcanoes Irazú (11,200 feet), Turialba (11,000 feet), Barba (9,335 feet), and Poas (8,675 feet). Eruptions occurred in 1723, 1726, 1821, 1847, 1864, and 1866. The southeastern or Talamanca group, in which there are no signs of recent volcanic activity, includes the Buena Vista (10,800 feet), Chirripo Grande (11,850 feet), Pico Blanco (9,650 feet), etc. A transverse system, the Cordillera de Dota, below Cartago, renders communication between the northern and southern sections of the country exceedingly difficult. More than one half of the area of Costa Rica lies between 900 and 2,100 metres above the sea, and is covered with virgin forests, the vegetation being so dense that it is almost impossible to penetrate the interior of these regions save by way of the rivers. From the coast to a height of 900 metres are tropical forests and savannas; above 2,100 metres are the regions of oaks and chaparrales, extending up to 3,050 metres; and subalpine or subandine flora characterize the regions between 3,050 metres and the tops of the highest mountains.

Fauna.— The tapir, deer, puma, jaguar, armadillo, iguana, and many varieties of monkeys, are found in the forests, a few species being peculiar to Costa Rica, while the rest belong as well to South or North America. Of *avifauna* there are 725 known species; of *reptilia* and *batrachia* over 130 species; and the species of fish are especially varied owing to the circumstance that those of the Pacific are almost wholly different from those of Caribbean waters.

Mineral Resources.— From three mines near the Gulf of Nicoya the exports of gold in 1900 were valued at $160,000. The production up to 1902 of one of the three principal auriferous districts has reached the sum of $10,000,000. The following comment is made by a mining expert: "Considering that this sum has been produced by the crudest mining and metallurgical methods, the reward which would follow the proper application of capital sufficient to operate on a large and modern scale is surmisable." Coal deposits exist on both the Caribbean and Pacific sides of the republic. They are large and easy of operation; similar in character to those of the anthracite regions of Pennsylvania. Petroleum is found closely associated with the coal and also in large quantities. Iron, copper, and silver exist in several cantones.

Agriculture.— Coffee raising has long been regarded as the most profitable form of agriculture in Costa Rica, and the decline in the price of coffee has brought on the financial crisis from which the country is now endeavoring to free itself. The systematic cultivation of bananas has increased during recent years. About 20 steamers, each carrying from 12,000 to 20,000 bunches, clear from Limón every month for the northern markets. Indian corn, rice, and cocoa grow readily.

Imports and Exports.— In 1901 the imports were valued at $4,410,422.45, while the exports surpassed this figure by $1,172,775.46. Exports

of coffee reached a total value of $2,823,201.32; of bananas, $1,532,581.78; of gold coin and bullion, $682,492.23. The imports for 1902 amounted to $4,178,284.80, the United States sending goods to the value of $2,048,809; Great Britain, $700,675; Germany, $472,991; France, $168,690; Spain, $75,149; Italy, $65,059; Nicaragua (cattle), $288,034.80; other countries, $27,200; and in addition merchandise valued at $95,000 which arrived by parcels post. Imports from the United States include foodstuffs, machinery, tools, cotton prints, drugs, dynamite, paints, and oils. Imports of European origin classified as foodstuffs were of the value of $87,075 in 1902, as compared with $118,329 in 1901; whereas imports of foodstuffs (principally wheat, flour, and lard) from the United States increased from $493,078 in 1901 to $554,251 in 1902. At the two ports of Costa Rica, Limón on the Caribbean, and Puntarenas on the Pacific, the records of maritime movements during 1902 show: Total British tonnage, 175,000, represented by 127 vessels; total German tonnage, 171,000, represented by 115 vessels; total American tonnage, about 151,000, represented by 103 vessels.

Manufactures.— In San José, flour of excellent quality is produced. Small establishments for the manufacture of saddles, harness, shoes, hats, clothing, cigars, cigarettes, candles, soap, beer, alcoholic liquors, carbonated waters, etc., exist in various parts of the republic.

Transportation and Communication.— The Costa Rica Railway runs from Limón to the cities of the central uplands, and has several branch lines; the Pacific Railway (nearly or quite completed in 1903) connects San José with a good harbor on the western coast. Between Limón and New Orleans and Mobile there is direct communication by steamship lines several times each week. Between Limón and New York steamers run weekly. There is a regular service between ports of the Central American coast, from Colón to Belize. Sailings to Jamaica, Cuba, and England are fortnightly. French, German, and Italian steamers call at Limón once a month. On the Pacific coast there are three regular lines touching at Puntarenas: the Pacific Mail, and the Chilean and British lines. Telegraph lines are government property. There are about 100 offices, and 1,300 miles of wire.

Weights and Measures.— The libra = 1.043 pounds; manzana = 1.5-6 acres; centaro = 4.2631 gallons; fanega = 1.5745 bushels. The metric system was established by law, 10 July 1884, but has not yet displaced old weights and measures.

Money and Banking.— The gold standard was adopted in 1896; in 1900 gold certificates were redeemed and gold put into circulation. The unit is the colon (value in United States gold or silver, $0.465). The gold coins are 2, 5, 10, and 20 colons; the silver coins, 5, 10, 25, and 50 centimos. The principal banks of deposit and emission are the Banco Anglo-Costarricense, established 1893, and the Banco de Costa Rica, established 1867.

Government.— The legislative branch of the government consists of a single house, called the Constitutional Congress; its deputies, who are chosen, one for every 8,000 inhabitants, for a term of four years by an electoral college, assemble each year for a 60 days' session which may be extended for 30 days. One half of the deputies retire every two years. Members of the electoral bodies are chosen by popular vote; they elect the president of the republic, as well as the deputies. The term of the presidents, in whom is vested the chief executive power, is four years. Congress annually appoints three substitutes called *designados*. Administrative departments in charge of secretaries or ministers appointed by the president are four; that of state (including foreign affairs, public instruction, justice, and worship); that of the interior, that of finance and commerce; and that of war and marine. An assistant secretary (*subsecretario*) assigned to an important bureau (for example, public instruction) reports directly to the constitutional congress. Judges also hold office for terms of four years. The main tribunals are the supreme court of justice (five justices), and two appellate courts (three magistrates each). Subordinate courts are established in the provinces and the comarca of Puntarenas. In the chief towns of each canton the alcaldes are judges of petty offenses, act as committing magistrates, and have jurisdiction in the less important civil cases.

National Debt.— The economic problems of the government were acknowledged in the inaugural message of President Esquivel, 2 May 1902, to be "grave and complicated." The total foreign debt in 1901 was £2,080,000; it was contracted in England in 1871 and 1872. The internal debt was less than 7,000,000 pesos. In March 1901 Costa Rican bonds to the value of 642,300 colones were incinerated, having been issued in 1897 and 1899, and subsequently redeemed. The revenue of the government is derived from custom-house duties, the liquor monopoly, tobacco, stamped paper, post-office, etc., the export duty on coffee having been abolished 1 Sept. 1901. In 1900–1 the total revenue in gold colones was 8,700,833; total expenditures 9,310,102.

Army and Navy.— All male citizens between the ages of 18 and 50 may be called upon to do military service; the standing army, however, numbers only 600, with 1,200 militia. The government has a gunboat and a torpedo boat.

Population.— The population in 1826 was 61,846, and mainly by increase of the families whose ancestors came from Galicia or Catalonia before the date just mentioned, it had grown by 1903 to 310,000. In marked contrast with the other Central American states, Costa Rica's population, in the larger towns of the uplands, is almost entirely white. Only a few thousand Indians remain, and the negroes live near the coasts.

The character of the people has been tested. Their troops were conspicuously successful against the filibuster from Nashville, Tenn., William Walker, who in 1855 forced the Nicaraguans to elect him to the presidency (see CENTRAL AMERICA). This feat established Costa Rica as one of the controlling forces in a group of small states, but an aggressive policy was not adopted then, nor has it been subsequently adopted. The inaugural message of President Esquivel (May 1902) made mention especially of the obligation and "traditional" policy of Costa Rica, to solve its own problems, and to avoid complications with other countries. Since Walker's expulsion, the most important events have been the promulgation of the constitution of 1870, and the arbitration of the boun-



1. National Theatre at San José.
2. A Country Church—Native Costa Ricans in Foreground.

dary disputes. The frontier line with Colombia (Panamá) was settled by the award of the president of the French republic as arbitrator, 11 Sept. 1900. President Loubet's decision extended the Colombian frontier to Punta Carreta on the Caribbean coast, thus depriving Costa Rica of extensive territory to which she laid claim. On the basis of this award, the present area is somewhat less than 22,000 square miles. Previous estimates have varied between 23,000 and 34,000 square miles. On 20 Jan. 1902, a "Convention of Peace and Obligatory Arbitration" was signed at the Port of Corinto, Nicaragua, by plenipotentiaries of Costa Rica, Nicaragua, Honduras, and Salvador.

Education.— Costa Rica has about twice as many teachers in its schools and colleges as soldiers in its army. Elementary instruction of both sexes is by constitutional mandate compulsory and at the government's expense. More than one half of all the children of suitable age are enrolled as pupils in the primary schools. The most recent statistics available at present show 327 schools in 202 different localities, controlled by educational juntas for whose support the government has made a special loan and imposed certain taxes. Higher education is provided at several provincial institutes, and at the Liceo and Colegio Superior de Señoritas — both of the latter in the capital. There are schools of law and medicine, a national museum, a national library, the University of Santo Tomas, and the Physico-Geographical and Meteorological Institution. The government has made a practice of defraying the expenses of a number of young men who are sent as students to European universities; and by the courtesy of the Chilean government six Costa Ricans are allowed free instruction at the pedagogical institute of Santiago (Chile).

History.— An account of the Spanish settlements at the beginning of the 16th century is given in the article Central America. The Spanish crown in 1540 established the province of Costa Rica; in 1560 and 1573 defined its frontiers; in 1562 appointed Juan Vasquez de Coronado military governor of Costa Rica and Veragua. The city of Cartago, until 1823 the capital, was founded by Coronado, but it was a city only in name. During the 1st century of the existence of the province no headway was made. The Indian tribes were the most intractable of their kind; white settlers were few. A brief period of comparative prosperity began when Capt.-Gen. Sandoval in 1638–9 made a new port at Matina and opened a road from it to the capital. The value of cacao plantations near the road increased, and the eastern coast, as well as the Gulf of Nicoya, was visited by trading ships. But the buccaneers swooped down upon the coast as soon as there was anything of value to be seized, and Indians completed the work of destruction. This wretched state of things continued throughout the 18th century.

One hundred years ago Costa Rica was described as the most benighted, woeful province in the whole Spanish empire. Its colonists, ignorant and indigent, "clothed with the bark of trees," had been reduced to such misery — generation after generation cut off from communication with the outside world — by century-long ravages of pirates from Europe and marauding bands of Indians from the Mosquito coast. But to-day, as we have seen, the republic holds a leading position among Latin-American nations in regard to public instruction, and it can no longer be called a very poor country. Every Costa Rican who cares to do so can own valuable property of some sort, and the foreign commerce of the country is far from being contemptible. The change may be described in a few words.

Less than four months after proclaiming that Spanish control was at an end (15 Sept. 1821), Costa Rica with the other weak Central American states was drawn into a union with the Yturbide empire of Mexico. This dependence lasted until 1824, and then followed the experimental union of the Central American countries. But genuine independence began with self-reliance after 1830. Even in that time of extreme poverty the state acknowledged and declared that it could not postpone and would not shirk its duty to provide for the education of the people. In better days it has devoted 10 per cent of the national revenues to this use. Thus Costa Rica's particular achievement, marking this little republic for distinction among Latin-American nations, has been the upbuilding of character through sacrifices made in the cause of popular education. During the first half of the 19th century commerce received a new impulse through the discovery of gold in the mountains near the Gulf of Nicoya, and the extension of coffee culture. Several of the presidents holding office since 1824 have been eminently patriotic and far-seeing men, under whose guidance the graduates of Costa Rican schools have begun to appropriate some of the natural resources of the land, with little aid from immigration, though not without the aid of foreign capital. Immigration up to the present time has been small.

Cities.— The capital, San José, in the province of the same name, has about 30,000 inhabitants. It is 103 miles by rail from Port Limón, and 59 miles by rail from Tivivis on the Pacific coast. Its altitude being about 4,000 feet above sea-level, the climate is agreeable, the temperature ranging from 65° to 78° F. It has three parks; three and a half miles of electric street railways, a telephone system, and electric lighting for the principal streets, which are macadamized or paved with stones. Principal buildings are: The National Theatre, National Palace, Palace of Justice, executive mansion, Episcopal palace, custom-house, mint, market, university, high schools for young men and young women, etc. There are also hospitals and asylums for orphans and the insane. The former capital, Cartago, has more than 12,000 inhabitants; Port Limón, 4,000; Heredia, about 9,000; Alajuela, 18,000; Puntarenas, about 6,000. Port Limón is about 2,025 miles (sailing distance) from New York. From San Francisco to Puntarenas the distance is given as 2,793 miles.

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Marrion Wilcox.

Costello, kŏs-tĕl'lō, **Dudley**, English novelist and journalist: b. Sussex 1803; d. London 30 Sept. 1805. He served as ensign in the West Indies in the earlier part of his career, and was subsequently foreign correspondent of several London journals. He was a magazine writer and the author of popular works of fiction, and among his writings are: 'Tour Through the Valley of the Meuse, with Legends of the Walloon Country and the Ardennes' (1845); 'Piedmont and Italy, from the Alps to the Tiber' (1850–01).

Costello, Frederick H., American writer: b. Bangor, Maine, 24 Sept. 1851. He is a commercial agent in his native city, and has written: 'The Two on Galley Island' (1893); 'Master Ardick, Buccaneer' (1896); 'Under the Rattlesnake Flag' (1898); 'On Fighting Decks in 1812' (1899); 'A Tar of the Old School' (1900).

Costello, Louisa Stuart, English writer and artist: b. Ireland 1790; d. Boulogne, France, 22 April 1870. She was a sister of D. Costello (q.v.). Her writings include: 'Songs of a Stranger' (1825); 'A Summer Among the Bocages and Vines' (1840); 'The Queen Mother,' a romance (1841); 'Gabrielle, or Pictures of a Reign' (1843); 'The Rose Garden of Persia' (1845); 'Clara Fane,' a romance (1848); 'The Lay of the Stork,' a poem (1856); etc.

Coster, kŏs'tĕr, or **Koster, Laurens Janszoon**, a reputed Dutch inventor of printing by movable types. By many he is regarded as a predecessor of Gutenberg, by some as a mythical personage. The first account of the invention which has any historical value appeared in 1499 in a book called 'The Chronicle of Cologne.' The author says that printing was invented in that city; he asserts, however, that the art was prefigured by the method used for printing certain school books or Donatuses in Holland. The next statement of importance in connection with the controversy is that of Hadrianus Junius, in his 'Batavia' (1588) to the effect that about 1460 Laurentius Joannes, surnamed Ædituus or Custos (literally sacristan, *Coster*), who lived in Haarlem, fashioned the bark of a beech-tree into letters, which he impressed upon paper. He then made a number of wooden letters, and invented an ink thicker and more viscid than the common sort, and afterward made, by the addition of his letters, explanations for pictures engraved on wood; and eventually printed books. Among these was an edition of the 'Speculum Salutis.' He subsequently changed the wooden letters for others of lead, and these again for letters of tin. An assistant stole the types and appliances, going first to Amsterdam, thence to Cologne, and finally sojourning at Mainz, where he published various books. This statement has been scoffed at as an invention or based on mere hearsay; but of recent years the trend of opinion has been in favor of the Dutch claims. There are no specimens extant that can with absolute certainty be ascribed to a printer called Coster. Many fragments of books, however, have been discovered, believed to be printed much before the date of Gutenberg's earliest work. These are known as Costeriana, and their number is being gradually added to since the attention of librarians has been called to their importance. They are printed in a variety of types of Dutch design. All are without any name, date, or place, and nearly all were discovered in the bindings of 15th century manuscripts or printed books. See Van der Linde, 'De Haarlemsche Costerlegende' (1870), translated into English by Hessels as 'The Haarlem Legend of the Invention of Printing' (1871); De Vinne, 'Invention of Printing' (1876); Hessels, 'Haarlem the Birthplace of Printing' (1887).

Costetti, Giuseppe, joo-sĕp'pĕ kŏs-tĕt'tē, Italian dramatist, b. Bologna 13 Sept. 1834. He early won fame by his dramas, 'The Mahbran'; 'The Lions' Den'; etc., and heightened it greatly by his comedies, 'The Son of the Family' (1804); 'The Old Story' (1875); 'Cain's Wife' (1887); etc.

Cos'tigan, John, Canadian statesman: b. St. Nicholas, Quebec, 1 Feb. 1835. He graduated at St. Ann's College, was a member of the New Brunswick legislature 1861–7, and was elected to represent Victoria County at the first general election for the Dominion House of Commons in 1867. He still (1903) retains the seat, being the only member who has held his seat continuously since the confederation of the Canadian provinces. He was minister of inland revenue 1882–92; secretary of state 1892–4; minister of marine and fisheries 1894–6.

Cost'mary, or **Mint Geranium**, a species (*Chrysanthemum balsamita*) of the genus *Chrysanthemum*, of the thistle family (*Compositæ*). The plant is a native of Italy, whence it was introduced into England in 1568, and cultivated for its fragrant leaves, which were used in ale and various aromatic drinks; and also as a salad. In America the plant grows wild from Nova Scotia to Ohio, having escaped from gardens. Another common name is alecost or alecoast. The name is popularly supposed to mean "the fragrant plant of the Virgin Mary," but recent authorities incline to derive it from the Latin *mare*, the sea.

Costume ("custom"; and especially usage, habit, or appearance in dress, etc.), a term now restricted to external dress and its modes. The history of costume is an exceedingly difficult one to trace in any accurate detail, owing to the difficulty of interpreting the vague and scanty notices on the subject which we can collect from the earlier writers. The most interesting and profitable thing will be to attempt to work out certain general lines of development, leaving minute questions to antiquarians who have made a special study of the subject, as far as anything can be accurately known about it. It must be observed that our earliest indications on the subject come from warm or semi-tropical countries; thus eliminating as far as possible the factor in the development of clothes which originates in the necessity of protection against the weather. Considerations of modesty, which may be regarded as the outgrowth either of specifically Christian or of other highly civilized conditions, according to the point of view, appear only in a rudimentary form. The development in early times is regulated largely by the desire to make the dress tell something of the position or rank of the wearer. Thus the earliest distinction as to the amount of clothing prescribed by custom seems to have been that the wearing many clothes was a mark of rank, while the lower classes were content with a very scanty covering. This would follow from the fact that the nobles had in those days very slight need

for active exertion; while practical considerations would dictate the minimizing of the garments which might hamper those whose employments required free movement of the limbs.

The early Egyptians seem to have worn little beyond an apron or loin-cloth; under the later dynasty it was extended into a long skirt, which was combined with the jacket that had been sometimes worn to form a complete garment. The women wore the *calasiris*, a shirt with short sleeves or none at all. Light and frequently transparent materials seem to have been most commonly used. For a headdress, both sexes wore what is known as the sphinx-cap. Here, as elsewhere, however, ordinary people paid very little attention to dress; kings, priests, and other officials were distinguished by elaborate vestures. Under the Ptolemies Greek costume was generally introduced. The Assyrians covered more of the body than the Egyptians, and used heavier stuffs — cotton, linen, wool, and possibly silk, introduced from China. They wore a long shirt with short sleeves, and confined at the waist. For the upper classes this was bright-colored and ornamented with heavy fringes. Sandals were worn. The king was distinguished by a purple mantle and a white cylindrical cap. The Persian costume was generally tight-fitting, consisting mainly of a short coat and trousers (which seem to have originated very early in Central Asia), often made of leather. When they conquered the Medes, they adopted very generally the dress of the latter, which was loose and usually woolen. The leather breeches remained in use among the lower classes.

The Greek costume was characterized by great simplicity, and fell into graceful folds. The principal parts of it were an undergarment called the *chiton* and a sort of cloak known as *himation*, which, when folded over the shoulders, ultimately originated a separate garment, the *diploïdion*. Men wore the *chlamys*, a short cloak, for the more active occupations, to which the *peplos* of the women partly corresponded. White was the usual (though not, as formerly believed, the exclusive) color of Greek garments; the material was most usually woolen among the Dorians and linen with the Ionians. Silk was introduced rather late from Asia, and employed to make the semi-transparent robes for which the island of Cos was famous. Oriental luxury increased as time went on, until in the Byzantine period, while clothes retained much the same shape, costly material and rich ornamentation distinguished them.

The Romans also commonly wore but two garments, and the hardy, vigorous life of their early days tended to keep these simple. They wore a woolen tunic for the house, only one at first, until the increase of luxury brought in the custom of wearing two or three in cold weather. Women also wore an outer robe known as the *stola*, similar to the Greek *chiton*. For appearance in public there was for men the *toga*, a large, loose, white cloak adopted by all citizens for out-door wear, and a somewhat similar garment called *palla* for women. While, however, men had a uniform manner of wearing the *toga*, women draped their robes in many graceful shapes at will. Shorter, more practical overgarments, such as the *lacerna* and the *sagum* or soldier's cloak, were worn by those engaged in more active occupations. The *torque*, or cord of gold fastened around the neck, was a fashion introduced from Gaul after the conquest.

The history of fashion in the Christian era may be divided into four periods:

First Period.— In the first, down to 486, the Gallic, Roman, and Byzantine elements were combining to form a new costume. In the second, 486 to 1300, this underwent many changes. The nobles vied with each other in introducing new fashions, though the middle class were far slower in adopting innovations, and the peasantry kept the traditional form almost unaltered down to the time of the Crusades. The third is the Renaissance period of transition, leading down to the fourth or modern era.

With the Roman conquest of Gaul came the introduction among the conquerors of the *braccæ* or breeches of the Gauls, first adopted for campaign wear by the Roman soldiers. As the empire went toward its end, extravagance in dress was unbounded among the wealthier classes. The women wore a sleeveless outside tunic confined at the waist by beautiful bands and on the shoulders by jeweled clasps. They delighted in wearing tunics of bright colors held in such a way that at least some portion of each tunic was revealed and brought into contrast with the others. A bright transparent veil sparkling with green and silver spangles fell from the head, and a short mantle hung from the shoulders. A sort of cornet or *strophium* fastened the veil on the head, and jeweled garters bound at the knee drawers of fine linen. Sumptuary laws were passed relating to the style of shoe to be worn by each class; but similar laws relating to the variety of jewels had little effect, since the general love for ornaments was too strong to be regulated.

Second Period.— During the Merovingian era (486–751) in France no important modification of the general scheme of clothing came in. The ruder element introduced by the rough Franks gradually softened beneath the enervating, refining influence of Roman fashions. The Frankish women who had been content with their simple costume of a black robe, a tight-fitting mantle, and a cap, were transformed to Merovingian ladies delighting in gay, trailing tunics of delicate tissues exquisitely embroidered. Their arms were still bare according to the ancient Teutonic fashion. Their hair fell in long braids, and was ornamented with fillets and flowing veils. As France acquired unity, the influence of both Roman and barbaric invasion visibly faded away. From the ancient shapeless tunic developed the gown, fitting closely to the waist and hips, and having the skirt full and flowing. This was the general principle of form from the accession of the Capet dynasty (987) down to the Renaissance.

Men's dress underwent little change down to the 12th century. The costume of the Frankish men of Charlemagne's time may be described as the approximate model. It consisted of two tunics, the outer one of wool or silk varying in length from the hips to the knees, according to the prevailing style. These were covered by a blue mantle, fastened on the right side with a clasp, and often highly ornamented and trimmed with beautiful furs and gold fringes. Head coverings of diverse and increasingly extravagant styles were among the first distinctive modifications; and these were sometimes combined (as

also in the development of academic costume) with a hood or cape falling over the shoulders.

Each century saw its own modification of these general types. It was a growing fashion in the 9th century for women's outer robes to stop at the knee and show a full sweep of the contrasting tunic beneath. In the 10th and 11th centuries the robe was belted by a rich girdle both above and below the waist. In the 11th century, too, the long train, in vain anathematized by the Church, became extremely popular. Sleeves reached the limit of absurdity in the dress of both sexes. At various periods the leg-of-mutton sleeve was worn, and in the beginning of the 15th century the outer sleeve widened at the wrist until it swept the ground. Commercial relations with the East were improved through the Crusades, and new varieties of costly fabrics were introduced. The splendor displayed in armor and military appointments affected the costumes of the women. Ladies of noble birth emblazoned their close-fitting gowns and surcoats. Even the dress of the middle classes, many of whom were dependents of the nobles and wore livery colors and armorial badges, acquired a heraldic character. The helmets, decked with scarfs and mantlings, suggested many grotesque varieties of feminine headgear, both in the 14th and 15th centuries. As the mantles of the knights but partly concealed their armor, so a surcoat worn by ladies only half concealed the beautiful decorated gown beneath. This surcoat was a jacket of varying shape; at one period it was only a coat without sleeves or sides; later a loose, flowing skirt was added to it, which in the 16th century stopped at the knee. The hip-girdle, of exquisite workmanship, which showed through the openings of the surcoat, was a counterpart of the military belt worn by the knights.

The end of the 14th century was marked by the excess to which the more fanciful devices of the period were carried. Robes were more fantastically cut along the edges, and decked with trailing ribbons, accompanied by a trailing tail to the hood. The pointed toes of shoes were often two or three times the length of the foot. The odd parti-colored gowns of the women blazed with heraldic impalements and quarterings. During the 13th, 14th, and 15th centuries there was great confusion about those garments which we know as stockings and trousers. One garment sometimes reaches the waist, even covering the feet. At others there were two articles, the nether stocks (Fr. *bas de chausses*) came to the thigh or knee and were continued by the trunk-hose or upper hose (Fr. *haut de chausses*). About 1600 the word breeches came into use to indicate the trunk-hose, and the term hose was confined to stockings.

Third Period.—This epoch was the transition from the mediæval to the modern style of dress. Speaking generally, up to the 14th century, long dress prevailed, loose and flowing, and offering a welcome contrast to the tight-fitting armor of the knight. About 1350 the costume of the men began to change, with the introduction of the doublet, a short jacket padded at the shoulders, plaited a few inches below the waist, and fastened with a belt. The nether stocks, now entirely exposed to view, were attached to the trunk-hose. Long, loose robes with immense drooping sleeves were indeed worn throughout the 15th century, but only by professional men or nobles on occasions of state. In women's dress the tendency appeared to cut the figure into sections instead of keeping to the girded gown. A bodice reached to the hips. The dress was somewhat shortened, and thus a step was taken toward the short hooped petticoat. During the Renaissance Period full forms became more and more popular, and petticoats and skirts spread into the form of a bell, which year by year increased in circumference.

Fourth Period.—A more distinct transition between ancient and modern dress took place in the 16th century. Men wore for show a short cloak which hung from the shoulders. The doublet was made with rather tightly fitting sleeves; beneath it was a sleeveless jerkin fitting the body and, like the modern waistcoat, so cut as to allow the beautifully embroidered shirt to be seen. The short skirt of the doublet was gored to fit the bulging trunk-hose padded with hair, while the lower hose were plain and tight, so that the figure looked broad and full above and narrow below. In this century began the wearing of the top of the nether garments loose, or slashed, with pieces of different colors let in. The arms and shoulders of the doublet or jacket were similarly trimmed. Boots were worn loose, with the upper part falling down. Ruffs, or ruffled collars, and velvet bonnets with feathers came into use.

In England the Tudor Period was characterized by great extravagance. The chronicler Hall describes several of Henry VIII.'s superb dresses, among them a "frocke" or coat of velvet embroidered all over with gold, the sleeves and breast cut and lined with cloth of gold and tied together "with great buttons of diamonds, rubies, and Orient pearls." The cloaks and mantles were of corresponding magnificence. The shirts were pinched or plaited, and embroidered with gold, silver, or silk. The shoes and buskins were of the German fashion, very broad at the toe, and of velvet and satin, slashed and puffed. A plain russet coat and a loose kind of kersey breeches, with stockings of the same piece, constituted the ordinary dress of middle-class men. The London apprentices wore blue cloaks in summer, and gowns of the same color in winter, as badges of servitude; for this was a period of domestic distinctions, relics of feudalism. The women wore long woolen gowns, worsted kirtles (hereafter called petticoats), and white caps and aprons. About this time white underlinen came into general wear.

In Elizabeth's time the men's huge trunk-hose, "stuffed with hair like woolsacks," were made of silk, velvet, satin, or damask. The doublets were very costly, quilted and stuffed, "slashed, fagged, pinched, and laced." The cloaks were of Spanish, French, or Dutch cuts; of cloth, silk, velvet, or taffeta; of all colors; trimmed with gold, silver, silk-lace, and glass bugles; equally superb inside and out. Hats now began to supersede the bonnets of the former era. They were for the most part made of felted wool, dyed. Those of beaver were exceedingly expensive.

The most conspicuous features of women's dress in the reign of Elizabeth were the farthingale and the ruff. The former consisted of an extravagant expansion of the lower garments by means of cane or whalebone. It was the predecessor of the hoop, which in its turn was succeeded by the crinoline. The widely ex-

tended ruff of fine linen, like a huge frill, is familiar from the pictures of Elizabeth and Mary of Scotland. The extravagance of the ruff reached such a point that it was anathematized from the pulpit, together with the extremely low cutting of the bodice; and the fancies of women's costume were denounced in a sermon preached before James I. at Whitehall, as "her French, her Spanish, and her foolish fashions."

England was slower than France, but ahead of Spain, in abandoning the farthingale and the ruff. In the beginning of the reign of Charles I., dress was little changed; the ruff, of thinner make, stood farther away from the throat, and looked like a framework of gauze, but the skirts were not so wide. In the middle of the 17th century there came a revolution against the entire system of padding, whalebone, starch, and wire, and for about 50 years the upper classes followed the canons of beauty and grace. Instead of the ruff, the Van Dyck collar, made of rich point-lace, was worn hanging down on the shoulder and held by a cord and tassel at the neck. Long breeches, fringed and pointed, met the ruffled tops of the boots; an embroidered sword-belt, worn over the right shoulder, held a Spanish rapier. In the flapping beaver hat hung a plume of feathers fastened by a jewel. Ladies' dresses were still made with skirt and bodice, the bodice defining but not cramping the figure, and the skirt hanging full and gracefully.

During the latter half of the 17th century, France, more than ever, gave the law to Europe in dress, and the typical style of the period is known as that of Louis XIV. — although, for accuracy, a distinction must be made between the gay and brilliant and the sombre parts of his reign, in the latter of which a tendency toward sober plainness not unlike that of the English Puritans was felt. The result of long struggles with inconveniences of dress was a nearer approach to the modern masculine dress of three pieces, coat, waistcoat, and trousers. The richly laced and embroidered doublet was long and loose, and had large puffed-out sleeves reaching a little below the elbow. The rest of the arm was covered by the full sleeves of the shirt. The long, loose, sleeveless waistcoat showed beneath the doublet, and the wide, ruffled breeches were fastened at the knees with bunches of ribbon. The doublet had buttons and buttonholes for its entire length, thus becoming a coat. Instead of the lace collar the long, square-ended cravat was worn. In the early part of the 18th century this dress became more exact in shape and sober in tone. The doublet, now a coat, fitted the body. The absurd wide "petticoat breeches" were exchanged for close-fitting garments tied below the knee. The broad-brimmed hats were turned up on two sides, later on three, and edged with feathers or ribbons. Wigs, which had been some time in use, were worn still longer than before, hanging down in front or flowing upon the shoulder. The coats of the 18th century were of velvet, silk, satin, or broadcloth, and of fanciful colors. Hogarth's favorite color was sky-blue, Reynolds' deep crimson, and Goldsmith rejoiced in plum-color. Meanwhile women's dress had also become more stiff and formal. Long bodices were tightly laced over very stiff corsets; overdresses were bunched up in the neck and on the hips; and the hoop-skirt, as outrageous as the farthingale of the 16th century, was generally worn. About the middle of the century the sacque came into style — a loose gown, resembling the mantle of antiquity, which was looped over the hoop-skirt and furbelows or left trailing behind. Heavy towering headdresses replaced the simple ringlets of the previous century. Small muffs, flowing veils, and fans were important accessories. Muffs were carried for a time by men.

The formalities of the 18th century received a severe blow from the general tendency of the French Revolution toward simplicity. In the 10 years from 1790 to 1800 a more complete change was effected in dress by the spontaneous action of the people than had taken place in any previous period in the century. The change began in France, partly to mark contempt for old court usages, and partly in imitation of certain classes in England, whose costume the French mistook for that of the nation generally. It consisted of a round hat, a short coat, a light waistcoat, and pantaloons reaching to the ankles and fastened by buttons. A handkerchief was tied loosely around the neck, with the ends long and hanging down, and showing the shirt collar above. The short hair *à la Titus* was unpowdered, and the shoes were tied with strings in place of the buckles which had before been universal. This comparatively simple form of dress found many admirers in England and soon became common among the young men. The abandonment of hair-powder followed the imposition of a tax on its use, and with the giving up of wigs and powder came the fall of the cocked hat. Pantaloons which fitted closely to the legs remained in general use until about 1814, when the wearing of looser trousers, already introduced into the army, became fashionable, though many elderly persons still held to knee-breeches against all innovations. The general simplifying of dress subsequent to 1815 was not allowed to pass without a last effort to retain the elaborate fashions of the preceding period. The *macaroni* of the 18th century was now succeeded by the *dandy*, who prided himself on his starched collars, his trouser-straps, and the flashy bunch of seals which dangled from his watch-chain. The period covered by the Regency in England was indeed the heyday of this kind of dandyism; but even later it characterized not a few leading public personages.

The end of the 18th century witnessed a signal change in the style of women's dress. The gown no longer consisted of two dresses, an under and an outer one. The formal styles which had prevailed throughout the century and brought into use stiff materials such as solid damasks, velvets, satins, and silks, were replaced by the fashion of the short-waisted clinging gown made of muslin and soft silk. This "Empire" mode characterized the dress of the first quarter of the 19th century. Large, loose, warm coats and cloaks were used for outdoor wear. Elaborate hats, turbans, and caps were worn on all occasions. In the twenties there was another revolution. Skirts were shortened and trimmed with flowers, puffs, and ruchings; sleeves became fuller, and the waist came nearer its natural position. Then the sleeves began to widen and stiffen, and the hats grew larger and more cumberous. From these wide skirts the crinoline was evolved in 1854. In the seventies the skirt became narrower again, worn with a polonaise of a different color. Meanwhile the

size and shape of the sleeve was not constant for more than a year.

But it would be both impossible and profitless to follow the minute variations of changing fashion. To return to general principles, it is safe to say that neutrality is becoming more and more the basis of costume, at least for men. Extravagance in dress, especially among the Anglo-Saxon nations, has become a note of bad taste; and man's dress, which was formerly characterized by gorgeous display, is little more than a uniform which, with certain variations prescribed by etiquette, adapts itself to different functions and amusements. As a result of the general modern abandonment of formality, and the opening of new employments for women, together with their invasion of the realm of athletic sports, the simplicity which characterizes the masculine dress has come to exist more and more also in the feminine. Fashion is forced nowadays to accommodate itself, to some extent at least, to health and convenience; and only the artist and the antiquarian will be found to regret that the picturesque costumes of bygone days are to be seen only among the peasantry of distant and isolated lands.

Bibliography.— Racinet, 'Le costume historique' (1888) is the best general work. For the pre-Christian period, consult especially Layard, 'Monuments of Nineveh' (1850); Hope, 'Costume of the Ancients' (1841); Evans, 'Chapters on Greek Dress' (1893). For later developments, Hefner-Alteneck, 'Trachten, Kunstwerke, und Geräthschaften vom frühen Mittelalter bis Ende des 18ten Jahrhunderts' (1879–89); Jacquemin, 'Iconographie méthodique du costume du IVe au XIXe siècle' (1876); Lacroix, 'Manners, Customs, and Dress of the Middle Ages and the Renaissance, and the Eighteenth Century, Its Institutions, Customs, Costumes' (Eng. trans. 1877, 1887); Chevignard and Duplessis, 'Costumes historiques des XVIe, XVIIe, et XVIIIe siècles' (1867); Planché, 'Cyclopædia of Costume' (1876–9) and 'History of British Costume' (1874); Fairholt, 'Costume in England' (1885); Earle, 'Costume of Colonial Times' (1895); Pauquet, 'Modes et costumes historiques' (1862–4); Von Heyden, 'Die Tracht der Kulturvölker Europas bis zum Beginn des 19. Jahrhunderts' (1889); Quincke, 'Handbuch der Kostüme' (1896).

Costus, or **Costus Arabicus,** an aromatic much esteemed by the ancients, is the dried root of *Aplotaxis auriculata,* a composite plant, and is not derived from the plant *Costus arabicus,* as was at one time supposed. It is a native of the moist open slopes surrounding the valley of Cashmere. The roots are there burned as incense. They have a strong, aromatic, pungent odor, and are employed in protecting bales of shawls from moths. It is also used in India as a hair wash, as a stimulant in cholera, and as a stimulating ointment.

Cot, Pierre Auguste, pē-ār ō-gūst kōt, French painter: b. Bedaueux 17 Feb. 1838; d. Paris 18 Aug. 1883. He studied under Cogniet, Cabanel, and Bouguereau. Among his works are: 'Spring Time'; 'Prometheus'; 'Moreille'; 'The Swing'; and 'The Storm,' often called 'Paul and Virginia' (in the Metropolitan Museum, New York).

Cotabato, kō-tā-bā'tō, Philippines, a province in the southern part of the island of Mindanao; area, including dependent islands, 8,344 square miles. The chief river is the Grande River of Mindanao, known also as the Pulangui, the largest river of the Philippines. The province is the most fertile in the island, and rice, sugarcane, cotton, coffee, tobacco, corn, and vegetables are raised for home consumption. The gutta-percha trade is quite large, and is controlled by Chinese. The first United States military station was established in 1899, and in 1903 the province was placed under civil government. Pop. 4,150.

Côte d'Or, kōt-dōr, France, a department formed of part of the old province of Burgundy; area, 3,383 square miles. The surface is in general rather elevated, and is traversed by a chain of hills forming the connecting link between the Cevennes and the Vosges. A great part of the department is covered with forests. The valleys and plains are fertile, and there is good pasture land; but the vine culture is by far the most important branch of industry. To this department belong the first-class wines of Clos Vougeot, Romanée, Chambertin, Corton, Richebourg, Volnay, Pomard, Beaune, Montrachet, and Meursault. Côte d'Or is watered by the Seine, which rises in the northwest, and by several of its branches; by the Saone, and by Arroux, a tributary of the Loire. The climate is temperate; iron, coal, marble, gypsum, and lithographic stones are found, the first in large quantities. Côte d'Or is divided into four arrondissements, namely, Beaune, Châtillon-sur-Seine, Dijon, and Semur, with Dijon for its capital. Pop. (1891) 376,860.

Côte-d'Or (hill or hillside of gold), a chain of mountains in Burgundy, so called from the abundance of excellent wine which they yield. Their height varies from 1,400 to 1,800 feet. The chain runs from north-northeast to south-southwest, and is about 150 miles long, beginning at the plateau of Langres, and extending to the sources of the Bourbince and the Dheune.

Cotes, Roger, English mathematician: b. Burbage, Leicestershire, 10 July 1682; d. Cambridge, England, 5 June 1716. He was educated at Trinity College, Cambridge and in 1706 became first Plumian professor of astronomy and natural philosophy in his university. In 1713 there appeared a new edition of Newton's 'Principia,' thoroughly revised by the author with the assistance of Cotes, and containing an able defense of Newton's system from the pen of the latter. Cotes published only one independent work, an essay entitled 'Logometria' (1713); but after his death there appeared a volume entitled 'Harmonia Mensurarum' (1722). His name is still given to a theorem discovered by him relative to the circle. The correspondence of Newton and Cotes was published in 1850. Newton is reported to have said: "Had Cotes lived we might have known something."

Cotes, Sara Jeannette Duncan, Canadian author: b. Brantford, Ontario, Canada, 1862. She entered journalism as a correspondent for several Canadian and American newspapers at the Cotton Centennial in New Orleans in 1884–5; served on the staff of the Washington *Post,* Toronto *Globe,* and Montreal *Star;* married in 1891 Everard C. Cotes, of the Indian Museum; and has lived for several years in India. Her books include: 'A Social De-

parture' (1890); 'An American Girl in London'; 'A Daughter of To-day'; 'Vernon's Aunt, an Oriental Story'; 'The Simple Adventure of a Mem Sahib'; 'His Honor and a Lady'; 'A Voyage of Consolation' (1898); 'The Path of a Star' (1899); 'On the Other Side of the Latch' (1901); 'Those Delightful Americans' (1902).

Cotes-du-Nord, kōt-dü-nōr, France, a maritime department in the north, forming part of ancient Brittany; capital, Brieuc; area, 2,659 square miles. The coast extends about 150 miles; the herring, pilchard, and mackerel fishing is actively pursued. One of the main branches of industry is the rearing of cattle and horses; and in manufacturing, the spinning of flax and hemp, and the weaving of linen and sail-cloth. Among the minerals are iron, lead, and granite. Pop. (1901) 597,032.

Coteswold (kōts wōld) **Hills,** or **Cotteswold** or **Cotswold,** a range of hills in the county of Gloucester, England. They extend north and south about 55 miles; the greatest elevation, Cleeve Cloud, near Cheltenham, is 1,134 feet. The Severn and Thames rivers have their rise on the eastern slopes.

Cot'grave, Randle, English lexicographer: b. Cheshire; d. probably 1634. He was secretary to William Cecil, Lord Burghley, to whom he dedicated the French-English dictionary by which alone he is remembered. This work appeared in 1611, and is important not only as being the first of its kind, but as a valuable source of material for the elucidation of the philology of the English and French languages. It was remarkably accurate and reliable for its time, and has been several times reissued. Of Cotgrave's life very little is known.

Cothurnus, kō-thėr'nŭs, with the ancients, a kind of boot laced high, such as Diana and her nymphs are represented as wearing. The tragic actors also wore a cothurnus which differed from the hunting cothurnus in that it had a sole at least four fingers thick. See BUSKIN.

Cotidal, kō-tī'dal, having the tides at the same moment of time. Cotidal lines are imaginary lines marked on the surface of the globe, indicating where the tides are in the same state at the same time.

Cotil'lion, a lively dance of French origin performed by eight persons together, resembling the quadrille which superseded it. The name is now given to a dance which often winds up a ball, and which is danced with any number of dancers and with a great variety of figures, the pairs of dancers following in this the leading pair, and partners being successively changed.

Cotin, Charles, shärl kō-tăń, French author: b. Paris 1604; d. there January 1682. He is indebted for his notoriety, in a great measure, to the satires of Boileau. Among his poems are some which rise above mediocrity. It has often been supposed that Boileau introduced the name of Cotin into his satires because it furnished a convenient rhyme, and Moore refers to this in his 'Life of Byron.' But Boileau had good reasons for complaining of Cotin, who had represented him as a dangerous man. Unluckily his follies drew upon him a new enemy in Molière, who, in his 'Femmes Savantes,' introduced him on the stage, and exposed him to ridicule under the name Trissotin, which Molière at first wrote 'Tricotin.' The sonnet to the Princess Urania was by Cotin; and he engaged in a dispute respecting it with Ménage in the presence of a select society, in which the disputants used the same kind of language that Molière places in the mouths of Trissotin and Vadius. His 'Œuvres Mêlées' appeared in 1659, and his 'Œuvres Galantes' in 1663.

Cot'man, John Sell, English landscape artist and etcher: b. Norwich, England, 16 May 1782; d. London 24 July 1842. In 1798 he went to London to study art, and there made Turner's acquaintance. In 1807 he returned to his native city, where he taught drawing and published: 'Specimens of Norman and Gothic Architecture in Norfolk' (1817); 'A Series of Etchings Illustrative of the Architectural Antiquities of Norfolk' (1818); etc.

Cot'ner University, located at Bethany, Neb., was founded in 1889 under the auspices of the Disciples of Christ. It was named in honor of one of its most liberal patrons. The first building was erected on a prairie farm about five miles from Lincoln (q.v.), and the place was called Cotner. By the sale of lots a fund was obtained for the school, and the village of Bethany, which has grown up around the university, has a population of about 500. It has a preparatory and a college department, and, at present, grants only the degree A.B. In 1903 there were connected with the school 17 professors and instructors, and, in the college department, 100 students. The library contained about 3,000 volumes; the grounds and buildings were valued at $134,000.

Co'to, the reddish-brown, aromatic and slightly bitter bark of *Palicourea densiflora,* order *Rubiaceæ,* a tree of South America.

Cotoneaster, kō-tō-nē-ăs'ter, a genus of plants of the natural order *Rosaceæ.* There are some 20 species, mostly natives of Europe and western Asia. The plant is a shrub or small tree, some of the species being evergreen. It has been introduced and cultivated in the United States and England as an ornamental shrub, having bright red fruit which remains throughout the winter. The evergreen or fire-thorn (*C. pyracantha*) is a species which has escaped from cultivation and is found wild among the thickets about Philadelphia and Washington. Several species, among which are *C. microphylla* and *C. rotundifolia,* come from India, and are especially used for covering walls and rock-work. The seeds of these are said to contain prussic acid. Cotoneasters thrive in any good well-drained garden soil not too shadily situated.

Cotopaxi, kō-tō-pä'hē or kō-tō-paks'ī, the most remarkable volcanic mountain of the Andes, in Ecuador, about 60 miles northeast of Chimborazo; lat. 0° 43′ S.; lon. 78° 40′ W. Its upper portion, a perfect cone 4,400 feet in height and perpetually snow-covered save near the crater, shows conspicuously. This covering of snow conceals from the eye of the observer the inequalities of the ground. No point or mass of rock penetrates the coating of snow and ice, or breaks the exact regularity of the conical figure. The crater is surrounded by a small circular wall, which, when viewed through a telescope, appears like a parapet. Its height above the sea is 19,550 feet. Remarkable eruptions, spreading destruction over the surrounding plains, took

place in 1698, 1738, 1742, 1744, 1766, 1803, and 1877. In 1698 the eruption destroyed the city of Tacunga, with three fourths of its inhabitants, and other settlements. In 1744 its roarings were heard as far as Honda, on the Magdalena, 600 miles distant. With respect to the explosion of 1803, Humboldt observes: "At the port of Guayaquil, 52 leagues distant in a straight line from the crater, we heard day and night the noise of this volcano, like continued discharges of a battery; and we distinguished these tremendous sounds even on the Pacific Ocean." A similar eruption took place in 1885. Part of a neighboring village was overwhelmed; and at Guayaquil a sound was heard like the incessant discharges of heavy artillery, shaking the earth and causing doors and windows to rattle. Humboldt found it difficult to ascend the mountain as far as the limit of perpetual snow, and he pronounced it impossible to reach the summit. It has been ascended, however, at least twice, on the latter occasion by Mr. Whymper in 1880, who remained 24 hours on the top. He reports that more or less smoke and steam are always issuing from its crater.

Cotswold. See SHEEP.

Cotta, Johann Friedrich, yō'hän frēd'rĭh kŏt'tä, BARON COTTENDORF, German publisher: b. Stuttgart, 27 April 1764; d. there 29 Dec. 1832. He began business at Tübingen, but in 1811 removed to Stuttgart. He was the publisher for many great writers in Germany, including Goethe, Schiller, Wieland, Richter, Uhland, Fichte, Hegel, the Humboldts, and others. He founded the 'Horen' (1795) and the 'Allgemeine Zeitung' at Augsburg (1798).

Cot'tage, originally a small house with no land attached to it. Such erections were discouraged by old English law. No one was allowed to erect a cottage unless four acres of freehold land were attached to it; and no more than one family was to inhabit it.

Cottage Grove, Ore., a city of Lane County, at the extreme head of the Willamette Valley, near the foothills of the Calipora mountains. It is located on the Willamette River and on the Southern Pacific R.R., 144 miles south of Portland. It is the terminus of the Oregon & Southeastern R.R. Cottage Grove was first settled about 1850. The principal industries are lumber, stock-raising and farming, planing and sawmills, etc. The city has a national bank, and a well-equipped electric light plant. Water is supplied by a gravity system owned by the city. There are many gold and quicksilver mines in the vicinity of Cottage Grove, and the surrounding country is covered with forests of fir and cedar timber, constituting one of the best remaining tracts of timber on the Pacific Coast. Pop. (1904) 2,200.

Cottage City, Mass., a town in Dukes County, situated on the coast in the northeastern part of the island of Martha's Vineyard. It was formerly a camp-meeting ground, and is now a popular summer resort. Pop. (1900) 1,100.

Cottar's Saturday Night, a famous poem by Robert Burns, first published in 1786.

Cotter, Joseph B., American Roman Catholic prelate: b. Liverpool, England, 1844. He came to the United States in 1850, studied theology at St. John's University, Collegeville, Minn., was ordained priest 1871, and was pastor of St. Thomas' Church, Winona, Minn., 1871–89, when he was consecrated first bishop of the Roman Catholic see of Winona. He is a pronounced advocate of total abstinence, and has been three times president of the Catholic Total Abstinence Union of America.

Cottier Tenure, a system of tenure according to which laborers rent small portions of land directly from the owner, or from a farmer, often giving personal service as part of the rent, and holding by annual tenancy.

Cottin, kŏt-tăn, Marie (called also **Sophie**) **Risteau,** better known as MADAME COTTIN, French novelist: b. Paris 22 March 1770; d. 25 Aug. 1807. In 1790 she married M. Cottin, a banker of Bordeaux, who died in 1793, and thenceforth she followed literature. Her best-known work is 'Elizabeth, or the Exiles of Siberia' (1806); other novels are: 'Claire d'Albe'; 'Malvina'; 'Amélie'; and 'Mathilde.'

Cot'tle, Joseph, English bookseller and author: b. 1770; d. Bristol 7 June 1853. The earliest poems of Southey and Coleridge were published by him, and these two poets in later life expressed their appreciation of his assistance and kindness to them. He also published Coleridge's periodical, 'The Watchman,' and the 'Lyrical Ballads of Coleridge and Wordsworth' (1798). He then retired from business. His own works include: 'Malvern Hills'; 'John the Baptist'; 'Alfred, an Epic'; etc. Cottle's poems, and those by his brother, Amos, are satirized in Byron's 'English Bards and Scotch Reviewers.' A prose work, 'Early Recollections,' chiefly relating to Samuel Taylor Coleridge (1837), is marked by glaring bad taste, though it has some value as containing many details of the early life of the poet. A second edition appeared (1847), entitled 'Reminiscences of Coleridge and Southey.'

Cotton, Charles, English poet: b. Beresford Hall, Staffordshire, 28 April 1630; d. Westminster February 1687. In 1658 he inherited his father's estates, near the river Dove, on the banks of which he built a fishing house, in which he entertained for years his friend, Izaak Walton. His works are numerous, including: 'Scarronides, or Virgil Travestie' (1664–70), being the first and fourth books of Virgil's 'Æneid,' in rather indelicate burlesque; and a translation of Montaigne's 'Essays' (1685). After the death of Cotton a volume was published, entitled 'Poems on Several Occasions.' He also translated 'Horace,' a tragedy of Corneille (1671); but the work by which he will be best remembered is the part which he added to the fifth edition of Walton's Complete Angler — 'Instructions How to Angle for a Trout and Grayling in a Clear Stream.'

Cotton, Charles Stanhope, American naval officer: b. Milwaukee, Wis., 15 Feb. 1843. He entered the Naval Academy 1858, served on the frigate St. Lawrence, which captured the Confederate privateer Petrel, in July 1861; on the flagship Minnesota 1861–3; took part in the battle between the Monitor and Merrimac 8–9 March 1862; and as lieutenant, served on the Oneida during the battle of Mobile Bay and subsequent operations to the surrender of Fort Morgan. He was promoted commander, 25 April 1877, and was on the Asiatic station 1880–3; captain 28 May 1892, and commanded

the flagship Philadelphia on the Pacific station 1894–7. During the war with Spain he commanded the auxiliary cruiser Harvard. He is now (1903) rear-admiral and has been commandant of the Norfolk Navy Yard since July 1900.

Cotton, John, American Puritan clergyman: b. Derby, England, 4 Dec. 1585; d. Boston, Mass., 23 Dec. 1652. He was educated at Trinity College, Cambridge, and was afterward Fellow of Emmanuel and employed as lecturer and tutor. About 1612 he became vicar of St. Botolph's Church in Boston, Lincolnshire, where he remained 20 years, noted as a preacher and controversialist, and inclining in his doctrines and practices toward the Puritan worship. He was at length informed against for not kneeling at the sacrament, and cited to appear before Archbishop Laud in the high commission court. Upon this he sought safety in flight, arriving in Boston 4 Sept. 1633. In October he was ordained on a day of fasting, by imposition of hands by the minister and two elders, teacher of the church in Boston and colleague with Mr. Wilson the pastor. In this connection he remained over 19 years, with such influence and standing that he has been called the patriarch of New England. His reputation for learning was very high, and, as was frequent among the ministers of that time, was sustained by an accumulation of obscure and professional knowledge. He was a critic in Greek, wrote Latin with elegance, and could discourse in Hebrew, and spent 12 hours a day in reading, his favorite author being Calvin. His pulpit eloquence was famous for its simplicity and plainness, and his discourses were exceedingly effectual in exciting attention to religion. His publications were numerous, consisting of sermons and controversial works upon most of the subjects discussed in his time. The most important are those published in the course of his controversy with Roger Williams, 'The Bloody Tenent Washed and Made White in the Blood of the Lamb' (1647), etc., and 'The Keys to the Kingdom of Heaven and the Power Thereof,' on the nature of church government. He maintained that the church is constituted of elders and brethren; that the elders are intrusted with the government to the extent of admissions and excommunications, yet that there is so much liberty left among the brethren that nothing of common concern can be imposed upon them without their consent. Against Williams he defended the interference of the civil power in religious matters for the support of the truth, maintaining the duty, for the good of the church and of the people, of putting away those who, after repeated admonitions, persist in rejecting fundamental points of doctrine or worship. A tablet, with a Latin inscription by Edward Everett, was erected in Saint Botolph's Church in 1857, in honor of Cotton, chiefly by contributions from his descendants in Boston, Mass. Consult Cotton Mather, 'Magnalia' (1702); McClure, 'Life of John Cotton' (1846); Tyler, 'History of American Literature' (1878).

Cotton, Sir Robert Bruce, English antiquary: b. Denton, Huntingdonshire, 22 Jan. 1571; d. London 6 May 1631. He settled in London, devoting his time to antiquarian pursuits, and employing himself especially in collecting ancient deeds, charters, letters, and other manuscripts of various kinds, illustrative of the history of England. He was one of the earliest members of the Antiquarian Society; and not only promoted the general objects of that learned association, but also assisted, with his literary treasures as well as with his purse, Camden and others writers on British archæology. He sat in Parliament under James I. and in the first and third Parliaments of Charles I.'s reign, his sympathy being against the growing power of the king. In 1629 he was falsely accused of having written an obnoxious political tract, and was thrown into the Tower; yet although he succeeded in establishing his innocence, his library was sequestrated, and his death seems to have been partly due to his being deprived of the company of his books. See Cottonian Library.

Cotton. This important vegetable fibre is readily distinguished from all other commercial fibres by its spiral twist, a character that renders it especially valuable for spinning. The wide-spread distribution of the plant, its adaptability to a great variety of soils and climates, and its comparative cheapness, all tend to make it one of the great staples of agricultural production, and it is probably used by more people and for a wider range of purposes than any other fibre. The country in which cotton was first used has not been definitely determined. It had long been known in India before the conquest of that country by Alexander. The writings of Herodotus and Pliny tell us that the excellence of its fibre was known to the Greeks and Romans. Columbus found it in use by the natives of the New World and in the conquests of Mexico and Peru cotton cloth was found to be in use. Ancient Peruvian tombs have yielded mummy cloths of cotton but those obtained from Egyptian tombs appear to be linen, although it is probable that cotton was known in that country from quite early times. While the principal commercial value attaches to the beautiful fibre that surrounds the seeds, the seeds themselves have important uses aside from that of producing a new crop. The stems and roots are also of value and the so-called by-products now utilized add fully 20 per cent to the value of the commercial cotton crop.

Botany, Commercial Classification, etc.— The cotton of commerce is a product of plants of the genus *Gossypium*, a member of the *Malvaceæ* or Mallow family of plants. There have been many attempts to classify and limit the species of *Gossypium*, but no two authorities agree. In a recent widely known catalogue of plants, about 50 species are recognized, and probably four or five times as many names combined or rejected. While this list of names is quite large there are only five or six species whose product enters into commerce and the bulk of the production is the product of two species, *G. herbaceum*, which furnishes the Upland cottons, and *G. barbadense*, the source of the Sea Island cotton. All the species are of tropical origin. They are small trees, shrubs, or herbaceous plants, enduring for one, two or more years, dependent upon the species. There has been much discussion regarding the origin of the many varieties of cotton grown in this country, but by almost common consent they are all attributed to the two species mentioned above or to some of their numerous hybrids. The Sea Island cotton

is undoubtedly indigenous to America and was the type observed by Columbus, but the evidence for the American origin of the species to which the Upland cottons are referred is less conclusive. These two classes of cotton differ materially in their seed characteristics. The Sea Island has a small black seed from which the lint separates readily, while the Upland cottons have large seeds which are greenish in color and surrounded by a short dense fuzz beneath the longer and more valuable lint. Both of the species are perennial in climates without frost, but in cultivation they are treated as annuals. The plants are shrubby, 3 to 10 feet high, more or less branched and bear large, alternate 3- to 5-lobed leaves which when held to the light show numerous pellucid dots. The flowers, which resemble to a degree those of the hollyhock, mallow and hibiscus, are white when newly open in the varieties of Upland cotton, turning red with age, and a creamy yellow in the Sea Island, with a purplish spot at the base of the petals. The flowers are usually single in the axils of the leaves except in those varieties designated "cluster types" in which a number are produced together. Surrounding this conspicuous flower are three or more heart-shaped, fringed or deeply cut bracts which constitute the so-called "squares." The indentations of the squares are deeper and more numerous in the Sea Island varieties than in the Upland forms. The capsules within the squares are the "bolls." They are 3- to 5-celled and contain the seed covered with the white or slightly tawny lint. The bolls of Sea Island cottons are uniformly smaller and more sharply pointed, contain fewer and smaller seeds and longer lint than the Upland bolls. The lint of the Sea Island cotton is from one and one half to two and a half inches in length, while the Upland cotton of the *G. herbaceum* type seldom exceeds one and a half inches in length and much of it is shorter. There are numerous hybrids between these two types as is shown by the character of the seed and lint. The Sea Island cotton flourishes along the coast region of South Carolina, Georgia, and Florida, and also in Egypt, the famous Egyptian cotton being a development from American Sea Island cotton seed sent to Egypt a number of years ago. The varieties of Sea Island cotton furnish the finest and most valuable fibre, but their production is restricted by the soil and climatic requirements of the plants. The Upland varieties, while not furnishing so fine a quality of fibre, are grown over a much wider territory and the total production far exceeds that of the Sea Island. In India there is a perennial species to which the name *G. arboreum* is given. It is a small tree and grows about the temples, but is not cultivated to any considerable extent. It produces a fine silky staple, but its former high value is now believed to have been overrated. This cotton usually called Nurma, from its growing about temples, is also known as Deo cotton. From South America are received a number of varieties of cotton that have usually been attributed to *G. peruvianum*. They have a short, strong, curly fibre somewhat resembling wool and their smooth black seeds adhere in an oval mass, on which account they are called kidney cottons. The plant which produces this cotton is a small short-lived tree and like the Nurma cotton of India will not mature in the United States.

When considered commercially the fibre produced by the seed is the most valuable product of the cotton plant. Viewed under a good microscope it appears to be an irregular, flattened, twisted tube, the edges of which are somewhat thickened and corrugated. This twist distinguishes cotton from all other fibres and it is to this character that its superior value for spinning is due. The fibre of some of the wild species of cotton does not possess this twist and such as do not are of little value. If not thoroughly matured the fibre is more flattened, less twisted and thinner walled. Such fibres, if abundant in a sample, depreciate its value as they curl up, do not spin well nor dye evenly. Among the leading commercial types of cotton the fibre varies from $\frac{1}{2}$ inch to 2 inches or more in length and is exceedingly fine, the extreme diameter measurements being 0.0084 to 0.0064 inches, the longest and finest fibre being of the Sea Island types. The commercial grading of cotton is as follows: Samples, the average fibre of which is under 0.98 inch (25 millimeters) in length are called "short staple"; those between 0.98 and 1.17 inch (25 to 30 millimeters) are called "medium" and from 1.18 to 1.57 inch (30 to 40 millimeters) are called "long staple." Those exceeding 1.58 (40 millimeters) are "extra long." The "long" and "extra long" fibre produced in the United States are all from Sea Island varieties and their hybrids, the shorter ones being usually Upland cottons of the *G. herbaceum* type. Other classifications adopted by the New York Cotton Exchange are: What are known as "full grades" are designated by the words "fair," "middling fair," "good middling," "middling," "low middling," "good ordinary" and "ordinary."

To designate qualities of staple a half grade above the grades mentioned, the prefix "strictly" is used. Quarter grades between the half grade and the next higher full grade are referred to as "barely" prefixed to the full grade term and the quarter grade below the half grade is designated by the prefix "fully" to the full grade below. As examples a staple graded as "barely middling" is a quarter grade below middling, "strict low middling" is a half grade between middling and low middling and "fully low middling" is the quarter grade between the last and low middling, a full grade. This classification is generally adopted in this country, while for Europe that of Liverpool is followed. This differs from that of the New York Exchange in being somewhat higher in the low grades and lower in the high grades. These classifications are based not only upon the length of staple, but its fineness, color, freedom from dirt, etc., and are more or less subject to differences in judgment, although little variation will be noticed in determining the quality of a sample when presented for sale.

Like every crop of wide cultivation many varieties of cotton have been produced and named. Some of these achieved a wide reputation for some superior quality, flourished for a time and then disappeared. In 1880 the Census Report named 58 well known varieties, but in less than 15 years only six were still in common cultivation. In 1896, in a publication of the United States Department of Agriculture, more than 130 varieties were described, but

within half a dozen years many of them had disappeared from seedsmen's lists. While particular varieties may cease of cultivation in a short time, the general type remains and types of cotton can now be readily recognized that have been in cultivation for more than half a century. The well-known tendency of the plant to vary is responsible for the production of so many varieties. There is perhaps no cultivated plant that responds so quickly to changed conditions of soil, climate, and cultivation as the cotton plant, and to this can be ascribed the improvement and deterioration of many varieties. The most successful planters keep up the quality of their crop by continued selection of seed and for a crop that depends so much on the quality of the staple this is one of the most important considerations. The practice of planting seed purchased from gins and mills does more to depreciate the quality of the lint than any other factor.

Cultivation.— Cotton is grown under a wide range of climatic conditions and in a great variety of soils. Ideal conditions for its growth are a deep, mellow, rich soil, a warm steamy atmosphere with abundant moisture until the bolls are well developed, with drier atmosphere and soil while the fibre is ripening and being gathered. These conditions are more nearly approximated in the cotton districts of the United States than over any other large area. Dr. Wight, who has investigated the subject for India, says for the best development of fibre an increasing daily temperature during the period of greatest growth is required and the reason for the inferiority of Indian-grown cotton from American seed, as compared with that grown in the United States, is due to the fact that in India cotton planting depends upon the monsoons and the plant develops in a constantly decreasing temperature from seeding to gathering. Too cool weather in the spring stunts the plant; too much rain during the growing season makes the plants develop at the expense of boll production, renders the soil difficult of cultivation, and promotes the growth of weeds; drought stunts the plant and causes early maturing and a small crop of inferior quality; and frosts and cold nights cause the plants to turn brown and die. If the soil is too moist it should be drained.

The method of cultivation varies somewhat in the different countries where cotton is grown, but it is believed the system practised in the United States is the most nearly perfect. The methods adopted for the cultivation of Sea Island and Upland cotton differ somewhat in detail, but in general features they are alike. In the United States bedding up the land previous to planting is almost universally practised. Where manures or chemical fertilizers are used this is indispensable if economy is practised. The beds are raised 18 inches to 2 feet in case of Sea Island and less for Upland cotton. The fertilizer and drainage thus secured make a warm seed bed in the early spring. The beds are usually arranged to stand over the furrow of the previous year in which the old stalks and trash are thrown and covered deep enough to be out of the way of the plow. The seed is generally drilled in rows 4 feet apart and when the plants attain their first true leaf and the shoots are 2 to 4 inches high, they are thinned 8 to 14 inches in the row. The date of cotton planting in the United States extends from March 1 to June 1, the most of the crop being in by May 20. The earlier date marks the beginning in southern Texas and it grows later as one goes farther northward. The young plants begin to appear in about 2 weeks and the first true leaf is gained in 8 or 10 days. After the appearance of the true leaves the plant is no longer dependent upon the seed leaves for its nourishment and is less liable to injury by cold. The first blooms appear in southern Texas about May 15, and in Tennessee and North Carolina about July 10, with intervening dates for the intermediate regions. The first bolls open after an interval of about 6 weeks from blooming and picking begins about July 10 in southern Texas, August 15 in the coast region of South Carolina and Georgia, with corresponding later dates elsewhere, and continues until after frost has killed the plants, the last picking often being made as late as December 10. For the Sea Island cotton in South Carolina and Georgia planting is usually done between April 1 and May 1, and picking begins about September 1 and continues until December. The reason for the prolonged picking season is the unequal ripening and opening of the bolls on the plant. The fields must be gone through a number of times and the ripe cotton gathered from the open bolls, or great loss will be occasioned by the shedding of the cotton. Cotton picking is the most tedious and expensive operation in cotton growing. It is mostly picked by hand into bags or baskets hung from the laborers' shoulders and all available laborers are given steady employment. The usual payment for picking cotton is from 30 to 50 cents a hundred pounds of seed cotton, expert laborers earning from $1.00 to $1.50 per day. After picking, the cotton is spread to dry and then ginned to remove the seed and baled for shipment to market.

Yield and Cost of Production.— The yield and cost of production of cotton varies widely with different localities. Differences in soil, available labor, methods of culture, etc., all exert varying influences upon the production and its profitableness. The yield of Sea Island cotton is seldom more than ⅓ bale to the acre and its cost of production is estimated at from 14 to 21 cents a pound. The yield of Upland cotton, which is by far the bulk of the crop, averaged 211 pounds per acre for the crop of 1900–1. According to Hammond the yield of lint cotton is from ⅓ to 1 bale per acre in the Pine Levels Region, ⅓ to 1¼ bales per acre in the Prairie Region of the Southern States, and ¼ to ½ bale per acre in the Table Land region. The cost of production is estimated by the same writer to average 5.88 cents per pound of lint cotton in the eastern cotton-producing States, and 5.68 cents per pound in the western States. Watkins has compiled, in 'The Cost of the Production of Cotton,' replies from 3,335 plantations representing nearly every cotton-producing county in the cotton belt, showing that the Upland cotton crop produced in 1896 cost an average of 5.27 cents per pound and sold at 6.70 cents per pound. Of those reporting, 2,659 were operated at a profit, the average cost of production being 4.90 cents per pound, and the average selling price was 6.78 cents per pound; 676 reported losses, the average cost of production being 7.62 cents per pound with the

selling price averaging 6.52 cents. These figures include all expenses of planting, cultivation, fertilizers, rents, ginning, marketing, etc., and while probably approximating the average cost of production under the present system of cotton culture in the South, can not be taken to show the minimum cost under improved methods.

Cotton Diseases and Insects.— Recent investigations have revealed the causes of a number of well-known diseases of the cotton plant. Some of these are due to disturbances in the nutrition and assimilation of the plant, others are caused by the attack of fungi, while still others are caused by the production of galls on the roots by minute worms called nematodes. Of the first class the mosaic disease or yellow leaf blight, the red leaf blight, and the shedding of bolls are the most serious. These can be remedied to a great degree by better attention to the nutrition of the plants and drainage of the soils. Experiments conducted for a number of years at the Alabama Experiment Station indicate that liberal applications of kainit as a fertilizer would greatly reduce the liability to loss from the mosaic disease. The diseases due to fungi are of a different nature. The fungi find their way into the tissues of the plant, where they live parasitically, robbing the plant of its much needed nutriment and often causing destructive changes resulting in the death of the plant. Among the more destructive diseases of this kind are: Wilt or Frenching, soreshin or damping off, anthracnose, leaf blight, and rootrot. The wilt disease is caused by the fungus *Neocosmospora vasinfecta*. This fungus lives in the soil from which it gains entrance to the cotton plant through the roots. Once in the plant the fungus develops rapidly and plugs the water-conducting vessels, cutting off the water supply of the plant and causes it to wilt suddenly. This is the most conspicuous symptom of the disease and the wilting is usually followed by the death of the plant. The fungus lives for quite a while in the soil and where abundant necessitates the abandonment of cotton growing for a time. Some varieties of cotton, especially the Egyptian ones, seem more resistant than others and where adapted should be planted to the exclusion of susceptible varieties. Cowpeas and watermelons are subject to attacks of the same or similar fungi and should not be planted in rotation upon known infected soils. Soreshin, or damping off, is due to the fungus *Pythium debaryanum*, which causes the young plant to rot off at or near the surface of the ground. Anthracnose is due to *Colletotrichum gossypii*. It attacks the stems, leaves, and bolls. It begins as small red spots which spread and darken for a time, when the centres become grayish and a pinkish color appears on the spots. These areas are usually sharply defined and give to the bolls in particular an appearance sometimes called "bird eyes." The affected bolls either die outright or fail to open. The root rot is caused by the fungus *Ozonium auricomum* attacking the roots, causing their decay and the consequent destruction of the plant. The leaf blight due to *Sphærella gossypina*, and the mildew caused by *Ramularia areola*, attack the leaves and when abundant cause the partial or total defoliation of the plants. A bacterial disease of the bolls causes the destruction of the seed and lint within them. The nematode gall disease may readily be recognized by the presence of numerous galls upon the roots. These are caused by the widely distributed nematode, *Heterodera radicicola*, which lives in the soil and attacks the roots of a wide range of plants. Long periods of rotation and the cultivation of varieties not subject to attack are the only practical means of relief known.

Cotton is often seriously injured by insects of various kinds. Cutworms, plant lice, caterpillars, grasshoppers, stalk borers, etc., injure different parts of the plant, but the greatest damage done to the cotton crop by insects is caused by the attacks of the cotton worm or cotton caterpillar (*Aletia argillacea*), the cotton bollworm (*Heliothis armiger*), and the Mexican cottonboll weevil (*Anthonomus grandis*). See COTTON, INSECTS INJURIOUS TO; WEEVILS.

Manufacturing.— When cotton has arrived at the mill, the processes through which it must pass before being turned out as finished cloth are varied and more or less intricate. The most important step in the process of producing cloth from the raw materials is the spinning. This may be variously divided, each division embracing a group of separate manipulations. The fibre must first go through a preparatory process. The bales have their ties cut and the bagging removed when the contents of a number are thoroughly mixed to secure a more uniform product. The cotton is then run through an "opener" which cleanses the cotton from impurities, such as broken seeds, fragments of leaves and stalks, dirt, etc., and the individual fibres are thoroughly separated. It then goes to a machine that arranges the cotton into laps or rolls of an approximately uniform weight. From here it goes to the carding, combing, and drawing machines which straighten out the tangled mass, extract the very short fibres and secure the regular and uniform distribution of the fibres in parallel series. The "roving machine" draws the "sliver," as it is called, to a more uniform size and gives it a slight twist, after which the yarn is still more attenuated and twisted in the process technically known as spinning. In some mills the process stops with the production of the yarn, while in others it goes to the loom and after various manipulations becomes the finished product. In all the processes the manipulations are rather complicated and a minute description of them should be sought under the technical topics of spinning and weaving, the process being quite similar for all fibres. Many different kinds of machines are employed, some of them of great complexity, yet so skilled do the operatives become that a single person can readily attend to the almost automatic workings of a number of the most intricate spinning mules. Just as the bale is generally considered the unit of the cotton crop, so the number of spindles and looms is taken to indicate the relative capacity of the mills manufacturing it. Great Britain leads the world in the number of its spindles, having had in 1901 over 46,000,000, followed by the continent of Europe with 32,000,000, the United States with 21,000,000, Asia (Japan, India and China) with about 7,000,000, and Canada and Mexico with 1,100,000. In the United States the greatest development in cotton manufacturing during recent years has taken place in the Southern States. Prior to the Civil War and

for a number of years following it, but a very small proportion of the cotton crop was manufactured within the States where it was produced. During this time the development of the industry in the New England and other Northern States was constant, the rate of increase being steadily maintained. In 1860 there were about 300,000 spindles and 6,700 looms in operation in the Southern States as compared with 3,900,000 spindles and 93,300 looms in New England. In 1880 the same regions reported 542,000 spindles and 11,900 looms and 8,630,000 spindles and 184,700 looms respectively. About this time the question of transportation of the raw product to the northern mills and of the finished cloth to the southern markets became important considerations and the general industrial development of the South led to the rapid growth of the cotton manufacturing in the cotton-producing States. By 1895 the number of spindles in operation in the South was nearly 2,500,000, and for the next three or four years the increase reported was nearly 400,000 per annum. In 1899 there were more than half a million more set in operation, while the increase for 1901 was over 1,200,000, making the total for the Southern States at the close of that year 5,819,835 spindles, as compared with 15,050,000 spindles for the remainder of the United States. These figures are given from Latham, Alexander & Company's Report for that year. The increase in the number of mills and looms was about the same proportion, there being a total of 531 mills and 122,902 looms in the South at the same date. According to Shepperson the mills of the United States now consume about one third of the crop produced, those of the North taking in 1901–02, 1,996,000 bales and those in the South 1,912,000 bales. While the mills in the New England States and the Southern States consume nearly the same proportion of the crop, yet the value of the products varies widely. In 1900, according to the Twelfth Census, the New England States produced from 1,829,678 bales materials valued at $191,690,913, while the Southern mills from 1,479,006 bales turned out products valued at only $95,002,059. This difference is due largely to the character of the products, the staple goods of the southern mills being those classed as brown sheetings, while the northern mills turn out a finer product at a correspondingly increased valuation. The class of goods turned out by the southern mills requires the "middling" grades of cotton which produce a relatively heavy cloth. This difference in the product of the two regions follows the general trend of all enterprises, the coarser products being first attempted, the finer ones following after a time. While some effort has been made to increase the fineness of the southern product, the profit in the cheaper grades has thus far prevented any great development along that line. There does not seem to have been much of a demand on the Sea Island cotton crop by the home mills, that cotton being exclusively used in the very finest grades of cotton weaves.

Of recent years there has been considerable interest in what are called "mercerized cottons." This process is an important adjunct to cotton manufacturing. The process consists of subjecting cotton or other vegetable fibres to the action of caustic soda dissolved in water, after which they are treated with pure water followed by dilute sulphuric acid and again washed. This treatment with chemicals causes both a physical and a chemical change in the fibre. The cotton after treatment instead of a flattened, twisted fibre, is swollen, thickened, becomes cylindrical and the cell wall is greatly thickened, with its cavity correspondingly reduced. This process, which was discovered by an Englishman, John Mercer, and patented in 1850, was designed by him to strengthen the goods and render them more uniformly subject to certain dyes. The process fell out of use to a great degree, but recently new attributes of the treated fibre were discovered. The treatment causes a decided shrinking of the goods, a fact now taken advantage of in making certain kinds of crepe cloth. It was also found that if the yarn or cloth be treated and kept under sufficient tension to prevent shrinking without being stretched, the fibre becomes translucent, and acquires a lustre similar to and but little inferior to that of silk. While apparently very simple the process is one requiring great care and skilful manipulation while the yarn is passed through the various chemical baths under heavy rollers. In practice it has been found that Sea Island and Egyptian cottons are best suited to mercerization. These fibres are already long and silky and are more uniformly acted upon. The extent of this industry is already quite important; the additional value acquired by cotton so treated in 1900 is given in the Twelfth Census Report at $697,490, more than 7,973,000 yards of cloth and 1,600,000 pounds of yarn having been mercerized.

Cotton By-products.— In the early days of cotton growing the lint was considered the only valuable product of the cotton plant. Modern ingenuity, however, has found a use for nearly every part of the plant, and if fully utilized the commercial value of the available by-products of the cotton crop reported upon in the Twelfth Census would have been more than $80,371,000, or about one fourth the total value of the crop. The cotton stalks and leaves have a considerable value as forage and if plowed under without having been burned the bare stalks aid materially in maintaining the fertility of the soil. The average yield of stalks and other refuse from an acre of cotton weigh about 850 pounds. If returned to the soil together with a portion of the seed or its equivalent in meal, the growing of cotton exhausts soil fertility very slowly, the drain on the soil of a cotton crop being less than that of any of the staple crops of the United States. The air-dried plants rank as forage with such coarse fodders as corn stover, corn shucks, rye, oat, and wheat straw, etc. It has also been proposed to extract from the stalks the strong, coarse bast fibre which they contain. If a suitable machine could be obtained for decorticating this fibre in an economical manner it could doubtless be used as bagging for the bales. A process of this kind has been patented, but it is said not to prove altogether satisfactory. A ton of stalks should yield about 300 pounds of fibre if properly extracted. In Egypt and other countries where fuel is scarce the stalks are collected and used for fuel. The bark of the root, recognized in the United States Pharmacopœa under the name *Gossypii radicis cortex,* is an active emmen-

agogue, having an action similar to that of ergot.

In computing the money value of cotton by-products none of those just mentioned are included, but only the more important products of the seed are considered. Next to the lint the most valuable commercial product of the cotton plant is its seed. As picked from the plant cotton consists approximately of ⅓ lint and ⅔ seed by weight, that is a crop of 9,000,000 bales yields about 4,500,000 tons of seed. About 7 per cent of the seed is used for planting, the remainder for oil, stock feed, fertilizer, etc. Prior to the era of cotton-seed oil mills, part of the seed was fed either raw or cooked to stock, a larger portion was plowed under as fertilizer, and the balance burned, thrown into rivers or disposed of in the easiest manner possible. The true value of the seed was not appreciated until about 25 years ago, but since 1880 the crushing of cotton seed and the extraction of the oil has become a large independent business. A ton of Upland cotton seed as it comes to the mill yields on an average 20 to 40 pounds of linters, about 1,000 pounds of meats and 800 pounds of hulls. When crushed and pressed the meats yield about 300 pounds of oil and 700 pounds of oil cake. The first process involved in reducing the seed to its products is that of removing the "linters" as the dense short fuzz is called. The yield of linters varies with the thoroughness of the ginning, sometimes amounting to 70 or 80 pounds to a ton of seed. These are removed as well as possible, for their presence would absorb considerable oil during the subsequent manipulations. Their chief use is as cotton batting. The hulls are removed next and they were formerly burned, but are now utilized as a coarse feeding stuff for cattle, and as such have a value of $2.50 to $4.00 per ton. At this rate cotton seed hulls are cheap substitutes for hay. The ashes of burned hulls have lately come into considerable demand as a fertilizer for tobacco, their value depending almost entirely on the relative abundance of potash and phosphoric acid which are present on an average of 23.40 and 9.08 per cent respectively. The cake residue from the presses, or the oil meal which is the crushed and ground cake, is extensively used both as stock food and as fertilizer. It is very rich in protein, nitrogen free extract, and fat, and can only be used to advantage as a feeding stuff when mixed with some coarser fodder. Analyses of the hulls and meal show that they supplement each other quite well as cattle feed, the hulls furnishing the necessary carbohydrates and the meal the required protein for a well-balanced ration. It was not until about 1883 that the possibility of feeding them together was definitely known, and in 1894 it was estimated that fully 400,000 cattle were fattened and 150,000 milch cows fed on rations made up very largely of cotton-seed hulls and meal. For fattening cattle, sheep, and other ruminants four pounds of hulls to one pound of meal is a successful ration, while for feeding to milch cows seven or eight pounds of hulls to one pound of meal is recommended, although an exclusive diet of this kind is not now considered advisable. In feeding cotton-seed products they should be fresh, since they appear to undergo changes after a time that render them deleterious, especially to calves and pigs. Even when fresh, for some unexplained reason, their use by young animals is attended with great danger. Cotton-seed meal is also extensively used as a fertilizer. It contains, in addition to potash and phosphoric acid, a large amount of nitrogen, and upon land that is not too dry may be compared with fish guano in its efficiency. Its value for this purpose, computed in the usual way that fertilizers are estimated, is from $20 to $25 per ton. It is an excellent fertilizer for sugar cane, corn, and cotton, and for tobacco it may be substituted for barn-yard manure.

Of the remaining constituents of the seed the oil is the most important. The report of the Twelfth Census shows there were 357 oil mills in operation which produced over 93,325,000 gallons of oil, valued at $21,300,000. The common method of oil extraction is to crush the decorticated meats and cook them in large heaters for 15 to 45 minutes, dependent upon the quantity, temperature of the vats, etc. This is one of the most important steps in extracting the oil, as too much or too little cooking diminishes the amount of oil and depreciates its quality. When in the judgment of the operator the meats are sufficiently cooked, they are folded in a camel's hair press cloth and gradually subjected to hydraulic or steam pressure that finally amounts to 3,500 pounds per square inch. Cold process oils are made, in which there is no preliminary cooking, and by some this quality of oil is preferred. When first expressed the oil is odorless, dark in color, and with a specific gravity of 0.92. This oil is then treated with alkaline solutions which precipitate the mucilaginous and albuminoid matter, together with the dark coloring matter, leaving a clear yellow oil which is drawn off, the residue being used for the manufacture of soap. With further refining this oil becomes what is technically known as "summer yellow oil." Ordinary "summer yellow oils" become cloudy at temperature of 28° to 40° F., rendering them unfit for many purposes, and "winter oils" are prepared that remain clear at 32° F. This is done by cooling the summer oils until the stearin or palmatin becomes crystallized. The hardened substances are pressed out and the remaining oil is used for salad oils, etc. "Summer yellow oil," bleached by the addition of about three per cent of fuller's earth, is changed to summer white oil, which is the basis of compound lard, cottolene, etc. "Miner's oil," which is used with kerosene as an illuminant, is made from "summer yellow oil" by treating it with sulphuric acid. In these various processes there is left considerable residue, which consists mainly of various fatty acids, and is used for making soaps. Cotton-seed oil is a slowly drying oil, on which account it is not equal to linseed oil when used with paint, although it is used to some extent in that way. It is also used as a lubricant, is employed in pharmacy, and to some degree in other arts. The coloring matter in the freshly expressed oil has also been separated, purified, and used as a dyeing material. Two important dyes have been separated, one, which is an oxydizing agent, giving a fine purple or violet blue color; the other, a non-oxidizing material called gossypin, affords a golden yellow to silk and wool.

Distribution and Production.— Cotton may be cultivated in nearly all portions of the globe between lats. 35° N. and S. or in a broad zone running around the earth and embracing the

tropics and portions of the temperate zones. Its most profitable cultivation at present is between lat. 20° and 35° N., although it is grown in Turkestan as far north as 45°. During Colonial times cotton was profitably grown in Pennsylvania, Delaware, and Maryland, and some is now grown in Kansas and Utah; however, the present limits of economic production in the United States is south of lat. 37° N. or a line running through southern Virginia, southern Kentucky, Missouri, and the northern boundary of Oklahoma. It is also grown extensively in India and Egypt, these two countries and the United States supplying fully 95 per cent of the world's crop. The estimated world's crop for 1900–01 was 13,858,000 bales, of which the United States produced 10,218,000 bales, India, including other Asiatic production, 2,390,000 bales, Egypt 1,100,000 bales, and South America 150,000 bales. For the countries other than the United States and possibly Egypt, the estimates of production do not represent the total crop, but only that portion that is marketed, and the most of it exported. India is known to have a large domestic consumption of cotton, but the amount cannot be estimated with any degree of accuracy. During the American Civil War, on account of the blockade of the southern ports, the price of cotton reached almost fabulous figures, and cotton culture was given quite a stimulus in Italy and other parts of southern Europe, as well as in Australia and elsewhere, but within less than 10 years the United States re-asserted her supremacy in cotton production and was again supplying the bulk of the requirements of the world's trade. The limiting conditions of profitable cotton growing seem to be temperature and distribution of rainfall or ability to irrigate. An average summer temperature of 73° to 75° F. and a winter temperature of 45° to 48° F. seem to furnish the proper temperature requirements, and the average distribution of rainfall of the Southern States, the moisture needed for the production of the best quality of fibre. Elevation and proximity to the sea are important factors to be considered for producing certain types of cotton, as may readily be seen in the wide variation in the quality of staple produced in contiguous regions.

The beginning of cotton culture in the United States is a matter of much speculation, but that it was carried on in a desultory way for a century or more, before becoming an important industry, seems quite probable. In some of the earlier accounts of Virginia, the writers claimed that cotton would grow in that colony as well as in any part of the world. Bancroft tells us that an experimental planting of cotton was made in Virginia in 1621, and the result was a subject of interest in America and in England. The industry spread rather slowly to the other colonies, but cotton growing had become important before the Revolutionary War in the region now known as the Cotton States. This was upland cotton. The history of the introduction and development of the culture of Sea Island cotton is better known. Sea Island cotton seed was brought from some of the West Indies, where it was indigenous, to Georgia in 1786, and it was at once found to be adapted to the coast region of that State. The following year, 1787, saw the introduction of this crop along the shores of South Carolina and Georgia, but its first recorded extensive production was in 1788, when Thomas Proctor raised 5,000 pounds upon a plantation near Savannah, Georgia, and reported it to the Philadelphia Society for the Encouragement of Manufactures.

During the early days of upland cotton-growing, the lint was separated from the seed by hand, about four pounds being considered a day's task. This slow process precluded the rapid extension of cotton production. The roller gin in use for ginning the Sea Island cotton did not differ essentially from that known in India 2,000 years before, and it was not adapted to upland cotton. In 1794 Eli Whitney patented his famous saw gin and made possible the enormous crops of later years. In estimating the cotton crop it is usual to begin the cotton year with September 1, the year being represented by figures that include portions of two calendar years, and the total yield is expressed in bales that may or may not be calculated to an uniform basis. Within 100 years, 1790 to 1890, the cotton production of the United States increased from about 5,000 bales to more than 10,000,000 bales of 400 pounds each. The cotton production of the United States by decades as given by Watkins in the United States Department of Agriculture, Division of Statistics, Miscellaneous Bulletin No. 9, was as follows:

PRODUCTION OF COTTON IN THE UNITED STATES.

Year	Crop	Net Weight of Bales
	Bales	Pounds
1790-91	8,889	225
1800-01	210,526	228
1810-11	269,360	297
1820-21	647,482	278
1830-31	1,038,847	341
1840-41	1,634,954	394
1850-51	2,454,442	416
1860-61	3,849,469	477
1870-71	4,352,317	442
1880-81	6,605,750	460
1890-91	8,652,597	473
1900-01	10,383,000	507

The largest crop produced in the United States was that of 1898–9, which was 11,275,000 commercial bales, and the smallest during the past 75 years was that of 1864–5, which was estimated at about 250,000 bales. The Sea Island crop, which is almost exclusively produced in the coast region of South Carolina, Georgia, and Florida, and on the adjacent islands, has averaged about 80,000 bales a year for the past 10 years, the crop of 1901–2 being estimated at 84,524 bales. The estimated total crop for 1902–3, according to the United States Department of Agriculture, was 10,417,000 bales of a net weight of 490.7 pounds, produced on 27,114,103 acres, or an average of 188.5 pounds of lint cotton per acre. The United States Census Bureau has been recently charged with the collection of statistics regarding the annual cotton production, and the estimate of that bureau for the crop of 1902–3 as shown by returns received from 32,753 ginneries, was 10,630,945 gross bales of 500 pounds each. The production of commercial bales by States was as follows: Alabama, 1,011,325; Arkansas, 999,629; Florida, 67,287; Georgia, 1,509,199; Indian Territory, 409,591; Kansas, 45; Kentucky, 1,308; Louisiana, 011,953; Mississippi, 1,451,626; Missouri, 49,552; North Carolina, 586,884; Oklahoma, 218,399;

South Carolina, 948,200; Tennessee, 328,019; Texas, 2,587,293; Virginia, 10,575. Of this large production about two thirds are exported, the mills of the United States only consuming about one third. While a large exporter of cotton, the United States imports considerable, taking annually about 100,000 bales of Egyptian cotton, most of which is used in the manufacture of Balbriggan underwear, hosiery, silk and cotton mixtures, and wool and cotton mixtures, etc.; and about 25,000 bales of Peruvian cotton, which is used exclusively to mix with wool to cheapen the cost of underwear, hosiery, etc.

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Cotton Famine, the destitution caused by the outbreak of the American Civil War (1861–5) in the English cotton manufacturing districts, especially in Lancashire. The cotton supply failed on account of the blockade of the southern ports of the United States, and in consequence the mill-owners finally closed their mills entirely, nearly 2,000,000 of people being reduced to great distress. A Cotton District Relief Fund was started, and a Relief Act passed by Parliament, by which loans were granted to the guardians of the poor for the purpose of instituting relief works. In 1863, in the midst of the war, three ship loads of provisions and supplies were sent to England from New York. Gradually the difficulties were overcome, and by June 1865 the distress was at an end, greatly increased supplies of cotton having been received from Brazil, Egypt, India, and elsewhere.

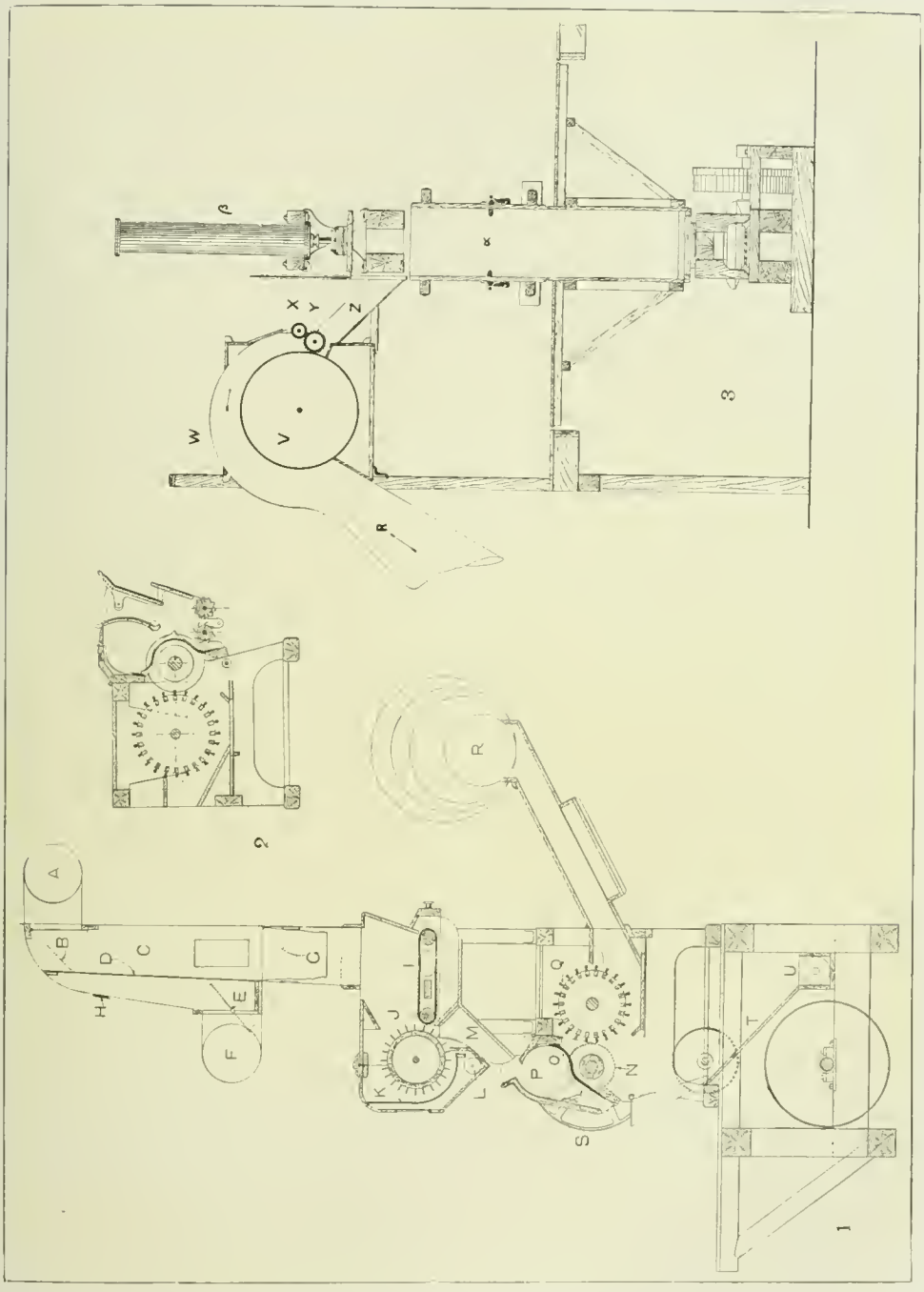
Cotton Ginning Machinery, machinery for preparing the raw or seed cotton for the cotton mills. Its primary object is separating the fibres of cotton from the seed. At present no successful mechanical means is in general use for harvesting or picking seed cotton from the stalks in the fields. The bolls begin to open in the latter part of July. When ripe they burst at the top and the locks of cotton streaming out are filled by the wind with sand and dust, and wet by the rains and dew. So to keep the cotton clean, picking must commence as early as possible and continue until the last of the crop is gathered. A day's work for an adult varies from 200 to 300 pounds, and of this weight about a third is lint and two thirds seed. Picking is done by contract at so much per hundred pounds, and the seed cotton is either stored in houses located in the fields, or carried in wagons to the gin houses where it is either stored temporarily or ginned at once from the wagons.

The earliest gin probably dates back to the days when the market price of animal skins became so great that man had to look around for a cheaper substitute for clothes. A primitive machine called the churka is an early gin. It is used to-day by the Hindus and Chinese. It consists of two plain rollers mounted on a frame and revolved in contact. Between these rollers the cotton is drawn and torn from the seed.

In most parts of the cotton belt of the United States the saw gin which Eli Whitney invented in 1794 is still the machine used to gin cotton. This cotton gin is one of the few mechanical inventions which seemed to spring spontaneously from the brain of the inventor a perfect machine. Evolution has done comparatively little to change its three essential elements, the saws, ribs, and brush. These have been retained in nearly all modifications intended to meet modern ideas, methods, means, and material of construction, and improve the quality and quantity of the staple of the cotton, but thus far no machine has been invented which can excel the saw gin in capacity. As the fibres of the cotton were found to be injured by the action of the saws, the McCarthy roller gin was introduced. It consists of a leather covered roller to which a knife is tightly held tangentially, and a moving blade that moves up and down in a plane just behind and parallel to the fixed knife. As the cotton is drawn between the rollers and the knife, the seeds are forced loose by the moving blade. The capacity of this gin is so limited that only the small part of the cotton crop which is of long fibre, like that raised on the sea islands of the Carolinas and Georgia and some parts of the river bottom lands, is ginned on it, and its limited capacity has prevented its general introduction throughout the South.

Until 25 years ago the average ginning plant consisted of one gin stand having a gang of 60, 70, or 80 saws, capable of turning out from 8 to 10 500-pound bales of cotton in a day. The isolated cotton plantations did not require a greater capacity than this size of plant, and each planter did his own ginning. But after the development of the Southwest with its large areas capable of raising cotton and the large number of small farms located close together, system gins were erected at railroad stations capable of ginning for the entire neighborhood. The scarcity of labor required that labor-saving apparatus be installed to get the cotton to the gins, and the product of ginning away. Thus this section of the country became the home of these labor-saving devices, and as the community grew, the competition of the gins with each other required a perfection of machinery never attempted in the older portions of the cotton belt. Then, as the development of the Southwest increased its competition with the Southeast, in self defense this latter section was compelled to adopt the methods which had grown up in the former. Small plantation gins were not rebuilt as they wore out or burned, but larger gins owned by a company of planters or merchants were built at the railway stations. Thus the entire cotton handling business underwent a revolution, until, for economy, speed, and

COTTON GINNING MACHINERY.



1. Vertical cross section of elevator, feeder, plain gin flue, and platform.
2. Cross section of Huller gin.
3. Vertical cross section of condenser and press

efficiency, cotton handling machinery grew and developed until it is on a parity with the machinery for handling the grain crops of the Northwest.

The constant danger of fire which hangs over all cotton gins has caused the different buildings which go to make a complete establishment to be separated. The cotton is stored in an isolated house at least 60 feet from the gin house, and its contents drawn into the gin by the inlet current of an exhaust fan. In most cases, however, at large gins it is not stored in the house at all, but taken directly from the wagons as they arrive at the gins, and each wagon hauls its cotton away, selling the seed to the ginner, who usually buys for some oil-mill and ships direct to them. The gin building proper is only large enough for the machinery which does the ginning; no cotton is in the building except that which is undergoing the process of ginning. The seed house in which the seed is stored is also detached from the gin building and usually located on a spur of the railway. In some cases an additional building is used to store the bales until they are shipped. Further to avoid the risk of fire and to insure better running of the machinery, the gins are located on a low platform three feet high. The floor of the building is brick or cement, and the building is made of brick, stone, or sheet iron.

The line shaft is carried directly under the gins where all of its journals are in sight; it can be easily oiled and hot-boxes instantly detected. At the end of the row of gins a higher platform is built to surround the press. Bales are taken out on this platform and can be thrown into the wagons thence without further expenditure of labor. After the mechanical processes of carrying by the exhaust fan and dropping the cotton into each gin, blowing it from the gins to the presses and its packing there by a steam tramper, the operation of putting on the bagging and tying the hoops is the first manual labor necessary after the feeding from the wagon into the telescope.

The principal machines used in a modern cotton ginning establishment, in the order in which they are used, are the telescope, the elevator, the exhaust fan, the feeder, the gin, the seed conveyer, the flue, the condenser, and the press.

The machine which makes the separation of fibres from the seed is known as the gin; all the other machines in the gin house, except the engine and boiler, are intended to either get the seed cotton to the gins, or to take care of the seed and lint after they leave the gin.

The telescope is an extensible tube which hangs from the inlet cotton pipe; it is counterbalanced and so arranged that its tube can be pulled down and kept close to the pile of cotton as it decreases in size.

The pneumatic elevator, which is now the apparatus most generally used to distribute cotton to the gins, is arranged as follows: *A* is the cotton pipe leading from the telescope. *B* is a valve which swings away from *A* and allows the cotton to enter chute *C*. *D* is a screen which prevents the cotton getting into the air pipe, and *E* is a valve which separates the chute *C* from the air pipe *F*. *G* is a flexible valve which prevents the air from entering the chute from below. *H* is a valve for admitting outside air. A chute is mounted over each gin feeder, all of the cotton pipes are connected to the common pipe *A* which extends to the telescope, and all of the air pipes are joined to the common pipe *F* which connects to an exhaust fan. The valves *E* are opened in rotation. In a system using four gins each valve is open a fourth of the time and closed three fourths. When air valve *F* in the first chute is open a vacuum is formed in the chute, the outside air carrying with it the cotton, rushes in from the telescope through valve *B*. The air is drawn through the screen into the fan, while the cotton strikes against the screen with enough force to take out a large part of dirt and dust, no cotton being ever allowed to get into the blades of the fan on account of the danger of fire which a spark might cause. As long as valve *E* remains open cotton continues to enter this chute and valve *G* remains closed, but when valve *E* in this chute is closed the corresponding valve in another is opened and the stream of cotton and air is deflected to the second chute, and the cotton in the first dropped from the screen and into the feeder below. Valve *H* is opened to allow fresh air to get in above the cotton and thus break the vacuum and blow the cotton off the screen.

The feeder which is located just below this elevator, and over the gin, has for its object the cleaning of the seed cotton, breaking up the lumps and then feeding the locks evenly and regularly into the gin. Its parts are as follows: A slowly moving apron *I* receives the cotton from the elevator and carries it to the picker wheel *J*. This wheel revolving with great rapidity picks up the locks of cotton and throws them against the screen *K*. The particles of dirt and trash go through this screen and are carried away by helical conveyer *L*. The cotton is rubbed over the screen and thrown on an inclined apron *M* which carries it into the roll boxes of the gins.

The gin used on upland cotton is practically the same in design as the one invented by Whitney. It consists of a gang of circular saws *N*, usually 70 in number, mounted about five eighths of an inch apart on a mandrel. A grating of cast-iron ribs *O* sits over these saws. The saws project through the spaces between the ribs and into the roll box *P*. The seed cotton from the feeder drops into this roll box and coming into contact with the teeth of the revolving saws, its fibres are stripped from the seed and carried between the ribs and out of the roll box, then the brushes *Q* clean the lint from the teeth of the saws, and at the same time generate enough air to blow the lint through the flue *R* to the condenser. Seeds freed from the lint are unable to go out through the space between the ribs, and so work out of the roll box to the adjusting board *S*, whose function is to hold them back until sufficiently cleaned or stripped of lint. Different varieties of cotton clean more or less easily, requiring different adjustments of this board. The seed rolls down an apron *T* into a helical conveyor *U* which runs under the line of gins and carries the seed into the blast of the same fan that draws the cotton to the elevator. The gin used on cotton grown in the river bottom or alluvial lands is modified from the plain gin for the following reasons: The cotton contains more woody bolls or hulls, either from the indifference of the picker or because the bolls do not open as

freely as the upland bolls do. It is necessary to extract these hulls to prevent their becoming mixed and cut up with the cotton fibres. This is accomplished as follows: The cotton is dropped from the feeder upon two small rollers. These feed it to the saws which drag it through a set of guards or fins which are located on the lower part of the rib and whose function is to strip off the hulls and prevent them getting into the roll box. The operation is then identical with the plain gins.

The flue which conducts the cotton from the gins is made of sheet metal and shaped like a long funnel with the larger end near the condenser. Cotton and air is blown from the gins into the main flue tangentially, thus insuring long, easy, spiral lines of travel, and as a layer of air is always between the walls of the flue and the flying cotton, friction is reduced to a minimum.

The condenser which is located at the end of this flue acts as a collector of the bunches of cotton that fly through the flue like snow, and makes them into a bat or sheet of cotton. It consists of a large revolving drum *U* covered with wire netting. The drum is surrounded by a rounded top *W* set eccentrically with it, with the wide part at the back where the flue enters. Each end of the drum opens into a dust flue leading to the outer air. The air and dust blown against this drum escapes out of the building while the cotton remaining on its circumference is carried around to the front where there are two doffing rollers *X* and *Y*. These wipe the cotton off of the drum, making it into a sheet or bat and also prevent the escape of the air into the house. This bat of cotton drops down the incline *Z* into the press.

The press used in all square bale system of gins, consists of two boxes mounted together on a turntable. Cotton from the condenser is allowed to drop into the first box and when enough cotton has been forced into it by the steam tramper the turntable is revolved and the other box comes in its place. The loaded box comes into position over a ram where it receives the final pressure. This ram is operated by a large direct acting steam cylinder, a hydraulic ram or a screw which is raised and lowered by a revolving nut. The bales turned out by this square press usually weigh 500 pounds gross. Of this weight about 30 pounds is the weight of the bagging which covers it, and of the steel ties which bind it. These bales average 28 x 56 x 42 inches in size and thus have a density per cubic foot of about 14 pounds. They are usually shipped from the gin house to some concentrating point where they are assorted and compressed and their size is reduced to 28 x 56 x 18 inches, giving them a density of 28 to 30 pounds per cubic foot. They are then ready to be shipped to the cotton mills.

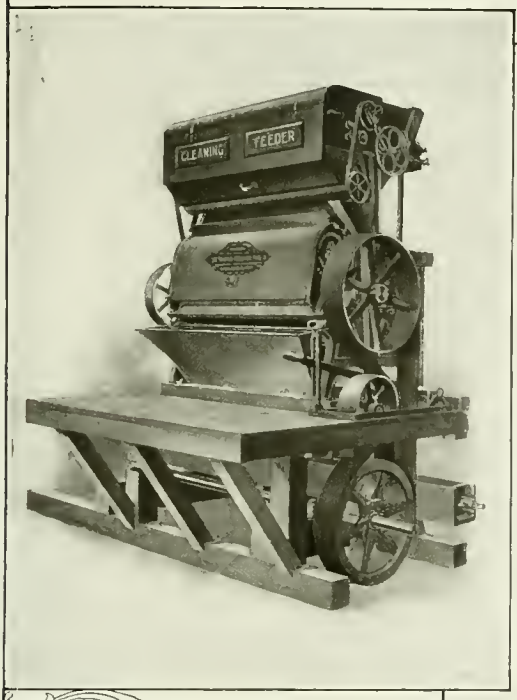
The large compresses which do this pressing are usually located at large concentrating centres. They are enormous machines weighing in some cases as much as 200,000 pounds, and are operated either by direct acting steam cylinders coupled to the jaws of the press by multiplying levers, or the jaws of the press are brought together by a large link moved by hydraulic rams sitting directly over the press. These rams receive their charge of high pressure water from generators located in the engine room, which are large direct-coupled steam pumps capable of filling the press ram at one stroke of the piston. The capacity of this press ranges from 800 to 1,200 bales in 10 hours. The bales while in the press are recovered and their bands are shortened to suit the reduced bulk. They are then loaded directly on the cars and shipped to their destination.

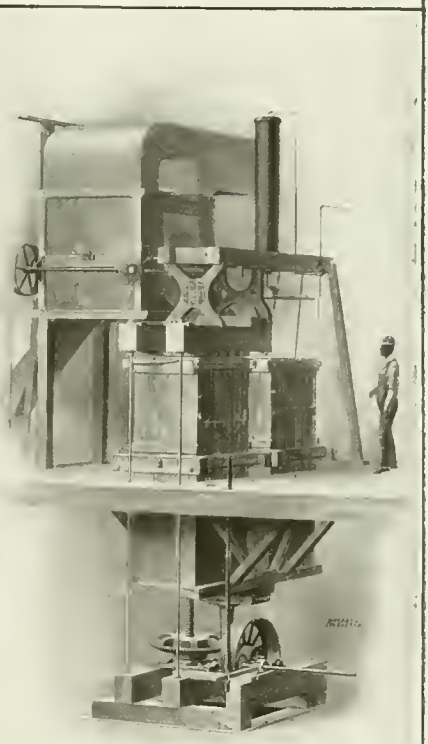
The round bale presses, which have been introduced within the last 10 years, are intended to take the place of the gin house presses, and to make a bale from the cotton as it comes from the gins, and at the same time pack it with sufficient density per cubic foot to allow it to be shipped direct to the mills without further compressing. They are a mechanical success and are sure to become universally adopted in time. There are two types of round bale presses, the older or round lap press, making a bale by wrapping layers of cotton batting around a spindle and then extracting the spindle, the bale growing in diameter as it is formed, and reaching a density of 35 pounds per cubic foot, measuring 35 inches long, about 22 inches in diameter and weighing about 250 pounds, and another type of press which makes the bales on end. The diameter, 20 inches, is constant, and the length varies as the weight, but averages about three feet. As high as 30 pounds per cubic foot density can be attained with this press. The bales weigh 250 pounds. The bales of the round lap press will unwind directly into the lapping machines of the cotton mills, thus doing away with one process through which all bales made on the square presses, or on the end-packed round bale presses have to go. In fact the round lap bale press is nothing more than a large, heavy lap machine used at the gin-house in place of the lighter one used at the mill.

The influence of improved machinery on handling cotton can best be illustrated by the following figures. In 1792 the exports of cotton from the United States was 138,342 pounds, scarcely more than 276 bales of 500 pounds each. Ten years after Whitney had invented the saw gin the exports amounted to 18,000,000 or 36,000 500-pound bales. Again in about 1876 the cotton crop was a little over 5,000,000 bales, then modern machinery began to be introduced, causing a saving in labor, and therefore the reduced cost of ginning acted as such a stimulus to cotton raising that at present the crop is about 11,000,000 bales. It is estimated that the introduction of the round lap bales which save the charges of compressing, and the expense of concentrating the bales, will make a net saving to the grower of almost $3.00 per bale, or $33,000,000 annually.

J. R. Fordyce,
Manufacturer Cotton Ginning Machinery.

Cotton-Grass, a genus of the sedge family (*Cyperaceæ*). About 10 species are distributed in the bogs and moist places throughout the northern hemisphere. The fruit of the cotton-grass is clothed at the base with a silky or cotton-like substance, which is employed in making paper and candle-wicking, also used for stuffing pillows. The plant was formerly used for medicinal purposes. A more recent attempt to employ the soft bristles as a substitute for cotton has naturally failed, as the fibre is less readily spun and not so durable.





GIN

PRESS

A GINNERY.

Cotton-gum (*Nyssa aquatica*), belongs to the natural order *Cornaceæ*. Besides this species there are three others, natives of eastern North America. It is a large tree, which sometimes reaches the height of 100 feet, with a circumference of four feet, abounding in deep swamps and ponds from Florida to southern Virginia and westward to Texas, Missouri, and Illinois. The wood of the *N. aquatica* is soft, though hard to split, and of a light brown, nearly white color. It is also called tupelo-gum.

Cotton Industry. The production of the cotton plant was very limited until the invention of the saw-gin. A number of cotton machinery improvements made prior to Whitney's invention of the gin had brought about an increasing demand in England for cotton, and there was considerable anxiety on the part of mill owners there as to whether production could be so stimulated as to cause it to keep pace with the growth of the demand. The total crop of the South in 1791 is estimated to have been 2,000,000 pounds, or 4,000 bales, of which about one tenth is supposed to have been exported to England. A shipment of eight bags had been made to Liverpool in 1784, though there are reports of small shipments prior to that date, which were probably West Indian cotton exported via Charleston. This shipment of eight bags was sold to an English firm in whose mill was employed a Samuel Slater, who in 1790 built in Pawtucket, R. I., a mill for Almy & Brown of Providence. It is supposed that the first mill built in the South was in the same year, 1790, and that it was in South Carolina. An early report states that a mill was then established in that State, driven by water and having "spinning machines with 84 spindles each." Thus the South built its first cotton-mill probably the same year that the foundation of New England's textile industry was laid by the building of the mill for Almy & Brown.

The spinning and weaving of cotton for domestic use, or, as it was called, the making of "homespun" goods, was almost universal throughout the South at that period. It is related of Jefferson that in his own household he "employed two spinning jennies, a carding machine and a loom with flying shuttle, by which he made more than 2,000 yards of cloth which his family and servants required yearly."

"The four southernmost States," said Mr. Jefferson in a letter written in 1786, four years before Slater built the small mill in Pawtucket for Almy & Brown of Providence, "make a great deal of cotton. Their poor are almost entirely clothed in it in winter and summer. In winter they wear shirts of it and outer clothing of cotton and wool mixed. In summer their shirts are linen, but the outer clothing cotton. The dress of the women is almost entirely of cotton manufactured by themselves, except the richer class, and even many of them wear a great deal of 'homespun' cotton. It is as well manufactured as the calicoes of Europe."

This domestic manufacture was very general throughout the South. The cotton for the spinning process was prepared in general by the farm laborers, who picked the seed from the lint by hand. The necessity of some improved method of ginning the cotton was so generally appreciated that many efforts were made to devise a method which would overcome the necessity of hand-picking. In 1792 Eli Whitney, a native of Massachusetts, while in Georgia, had his attention called to this need, and in 1793 he perfected the saw-gin.

In view of the discussion which has been going on for many years as to whether Whitney or Holmes is entitled to the credit for this invention, Mr. D. A. Tompkins, of Charlotte, N. C., in his 'Cotton and Cotton Oil,' gives a very complete and comprehensive history of the gin, and in closing says:

The real facts about the cotton gin are:

1. Eli Whitney, of Massachusetts, a graduate of Yale College, invented a cotton gin, consisting of spikes driven in a wooden cylinder, and having a slotted bar through which these spiked teeth passed, and having a brush to clear the spikes. He obtained a patent 14 March 1794, signed by George Washington, president; Edmund Randolph, secretary of state, and Wm. Bradford, attorney-general.

2. Hodgen Holmes, of Georgia, a resourceful and practical mechanic, invented an improved gin, using circular saws properly spaced, passing through spaces between ribs. For this invention he obtained a patent 12 May 1796, signed by George Washington, president; Timothy Pickering, secretary of state, and Chas. Lee, attorney-general.

3. Whitney's invention, consisting of a wooden cylinder carrying annular rows of wire spikes, with a slotted bar and clearing brush, was fundamental.

4. The practical application of the fundamental idea was Holmes' invention of the saw-gin, which consisted of a mandrel or shaft carrying collars separating circular saws which pass through narrow spaces between ribs.

5. Whitney went South without money, business experience or mechanical training. He received from the Southern States the following amounts:

From South Carolina	$50,000
From North Carolina (at least)	30,000
From Tennessee (about)	10,000
Royalties from Southern States	$90,000

6. In Georgia, his firm (Miller & Whitney) attempted to monopolize the ginning business. This brought on long and vexatious litigation, and the object was never successfully accomplished.

With the invention of the saw-gin the growth of the cotton business of the South became very rapid. The production advanced from 2,000,000 pounds in 1790 to 10,000,000 pounds in 1796, and to 40,000,000 pounds in 1800, while the yield of 1810 was 80,000,000 pounds, and that of 1820, 160,000,000 pounds. The rapid increase in the demand for cotton and the profitableness of its cultivation caused a concentration of the energy and capital of the South in cotton planting, and industrial interests which had been flourishing declined. According to Donnell's 'History of Cotton' the tariff on cotton goods was largely increased in 1816, the measure being strongly supported by the South on the ground that it would promote the consumption of its cotton, and opposed by some of the northern States because of their large shipping interests. From a crop of about 400,000 bales in 1820, production rapidly increased, the growth of this industry probably surpassing in extent and wide-reaching importance any other crop in Europe or America. The energy of the South was turned into cotton-raising with such vigor that production gradually increased more rapidly than the world's consumptive demand. Other agricultural interests were not, however, neglected. Diversified farming was the rule, and the South was more nearly self-supporting in the way of foodstuffs, such as corn, bacon, etc., than it has ever been since, notwithstanding the very marked growth in diversified farming during the last few years. In general, cotton prices were well maintained for 40 years, though gradually tending down-

ward at the beginning of the century. In 1801 the average New York price was 44 cents a pound, and from this it slowly declined (often with an upward spurt of a year or two) to 13 2 cents in 1839. With prices ranging from 13 cents to 44 cents per pound, and averaging for 40 years, from 1800 to 1839, a fraction over 17 cents per pound, cotton cultivation was so profitable that it is not to be wondered at that the people of the South concentrated their efforts more and more on cotton cultivation, to the neglect of industrial interests. By 1840 cotton production had advanced beyond the requirements of consumption, and there commenced a period of extremely low prices, the cotton States suffering very much from this decline. In that year the average of New York prices dropped to 9 cents, and this was followed by a continuous decline until 1844–5, when the average was 5.63 cents — the lowest average price for a year ever known to the cotton trade. Moreover, in 1844–5 the seed was without market value, while now the sale of seed adds largely to the value of the crop, and transportation is likewise very much cheaper than at that period. In 1847 the crop was short, and prices advanced sharply, only to drop back to 8 cents, and then to 7½ cents. These excessively low prices brought about a revival of public interest in other pursuits than cotton cultivation, and the natural tendency of the people to industrial matters, which had long been dormant, was again aroused, and for some years there was a very active spirit manifested in the building of railroads and the development of manufactures. In 1850 a period of much higher prices began, and for the next 10 years the average was about 12 cents a pound. The wonderful prosperity which cotton production at the prices prevailing up to 1860 brought about, except for the decade from 1840 to 1849, is illustrated in the statement that though the South had only one third of the total population of the country, and only one fourth of its white population, the assessed value of its property was, according to the census of 1860, $5,200,000,000, out of a total of $12,000,000,000 for the entire country, or 43⅓ per cent. With the coming of the War the cotton trade was completely demoralized, and the small amount produced during that period could only get to the markets by running the blockade. Prices rapidly advanced until in 1863–4 the New York average was 101½ cents. When the War ended the world was almost bare of cotton, the demand was pressing, and prices continued very high. But the South was bankrupt. It had but little capital on which to operate, its planters were burdened with debt, their houses and fences destroyed, their labor system disorganized; and in this condition they were in no position to buy or to produce foodstuffs and live stock. Money-lenders, however, seeing the world-hunger for cotton, were ready to make advances on mortgages on unplanted cotton, but not on other crops. Most of them were factors or commission merchants, who would agree to advance money or to grant credit at their stores for merchandise of all kinds against every acre planted in cotton. Under these circumstances diversified agriculture had to be abandoned, and the planter was forced to buy western corn and bacon, and devote all his time to raising cotton. By the time he had paid nearly double the cash values for his supplies, and had paid commission, storage, and drayage, and insurance on his cotton when marketed, the planter usually ended the year in debt to his factor. The profits of the factor, though, were sufficiently large to justify him in continuing his credit, and by doing so the average farmer was kept in debt from year to year, though, of course, the better class of farmers gradually worked their way to an improved financial condition. The negroes and the tenant class of whites could borrow money on cotton in the same way, and thus developed a tenant system for raising cotton, which prevented any attention being given to the improvement of the land. Year after year the farmer was forced into cotton-raising to the exclusion of everything else, until it became a common saying that "the South kept its corn-crib and smoke-house in the West." By 1880, although still heavily in debt, southern farmers had commenced to give more attention to the cultivation of grain and to raising early fruits and vegetables. The agricultural progress made by the South since that year has been very remarkable, but, despite the great increase in the production of corn and of foodstuffs, the yield of corn in the central Cotton States per capita does not yet equal the average prior to 1860, while the possibilities of wheat cultivation, shown notably in Virginia, Tennessee, Kentucky, and Texas, have yet hardly begun to be touched.

In the meantime the cotton crop has steadily increased, advancing from 5,456,000 bales in 1881–2 to 11,274,000 bales in 1898–9 — the largest crop ever produced, though the crop of 1900–1 of 10,383,000 bales yielded larger aggregate returns to the farmers, the total value of that crop having been $494,567,000.

According to the table of consumption of cotton in 20 years, it will be noted, the takings of northern mills have increased from 1,573,997 to 1,966,897, while the consumption of southern mills has increased from 221,337 to 1,620,931 bales. In 1880 the consumption at southern mills represented about 12 per cent of the total consumed in the whole country, but in 1900–1 the consumption of southern mills had increased to more than 45 per cent of the total consumed in the country. The actual consumption by northern mills since 1880 has increased very slowly and with many fluctuations, while that by southern mills has steadiiy progressed from 221,000 bales in that year, or less than one seventh as much as at northern mills, to over 1,600,000 bales, as against 1,960,000 bales at northern mills in 1900–1. With this progress in the number of bales consumed has come a tendency of southern mills to turn their attention to the finer goods. Moreover in the last decade the number of spindles in the South increased from 1,500,000 to more than 5,000,000. The South practically controls the trade in cheap goods from this country in China, and with the development of our commerce with that country southern mills may be expected to enjoy even a greater share of the trade than at present, while the campaign for diversification of products of the mills is likely to give the southern mills greater importance than ever and lead to the consumption in this country of a greater proportion of American-grown cotton.

Summing up in tabular form the statistics of the cotton crop since 1840 we have:

COTTON SINCE 1840.

Year	Crop Bales	Cons'mp'tn in U. S. Bales	Exports Bales	Average Price per lb. Middling Uplands in N. Y. Cents
1840–41	1,634,954	267,850	1,313,500	9.50
1841–42	1,683,574	267,850	1,465,500	7.85
1842–43	2,378,875	325,129	2,010,000	7.25
1843–44	2,030,409	346,750	1,629,500	7.73
1844–45	2,394,503	389,000	2,083,700	5.63
1845–46	2,100,537	422,600	1,666,700	7.87
1846–47	1,778,651	428,000	1,241,200	11.21
1847–48	2,439,786	616,044	1,858,000	8.03
1848–49	2,866,938	642,485	2,228,000	7.55
1849–50	2,223,718	613,498	1,590,200	12.34
1850–51	2,454,442	485,614	1,988,710	12.14
1851–52	3,126,310	689,603	2,443,646	9.50
1852–53	3,416,214	803,725	2,528,400	11.02
1853–54	3,074,979	737,236	2,319,148	10.97
1854–55	2,982,634	706,417	2,244,209	10.39
1855–56	3,665,557	777,739	2,954,606	10.30
1856–57	3,093,737	819,936	2,252,657	13.51
1857–58	3,257,339	595,562	2,590,455	12.23
1858–59	4,018,914	927,651	3,021,403	12.08
1859–60	4,861,292	978,043	3,774,173	11.00
1860–61	3,849,469	843,740	3,127,568	13.01
1861–62	War Period	War Period	War Period	31.29
1862–63				67.21
1863–64				101.50
1864–65				83.38
1865–66	2,269,316	666,100	1,554,664	42.30
1866–67	2,097,254	770,030	1,557,054	31.59
1867–68	2,519,554	906,636	1,655,816	24.85
1868–69	2,366,467	926,374	1,465,880	29.01
1869–70	3,122,551	865,160	2,206,480	23.98
1870–71	4,352,317	1,110,196	3,169,009	16.95
1871–72	2,974,351	1,237,330	1,957,314	20.48
1872–73	3,930,508	1,201,127	2,679,986	18.15
1873–74	4,170,388	1,305,943	2,840,981	17.00
1874–75	3,832,991	1,193,005	2,684,708	15.00
1875–76	4,632,313	1,351,870	3,234,244	13.00
1876–77	4,474,069	1,428,013	3,030,835	11.73
1877–78	4,773,865	1,489,022	3,360,254	11.28
1878–79	5,074,155	1,558,329	3,481,004	10.83
1879–80	5,761,252	1,789,978	3,885,003	12.02
1880–81	6,605,750	1,938,937	4,589,346	11.34
1881–82	5,456,048	1,964,535	3,582,622	12.16
1882–83	6,949,756	2,073,096	4,766,597	10.63
1883–84	5,713,200	1,876,683	3,916,581	10.64
1884–85	5,706,165	1,753,125	3,947,972	10.54
1885–86	6,575,691	2,162,544	4,336,203	9.44
1886–87	6,505,087	2,111,532	4,445,302	10.25
1887–88	7,046,833	2,257,247	4,627,502	10.27
1888-89	6,938,290	2,314,091	4,742,347	10.71
1889–90	7,307,281	2,390,959	4,955,931	11.53
1890–91	8,652,597	2,632,023	5,847,191	9.03
1891–92	9,035,379	2,876,846	5,933,437	7.64
1892–93	6,700,365	2,481,015	4,402,890	8.24
1893–94	7,549,817	2,319,688	5,287,887	7.67
1894–95	9,901,251	2,946,677	6,926,025	6.50
1895–96	7,157,346	2,504,972	4,751,384	8.16
1896–97	8,757,964	2,847,351	6,088,521	7.72
1897–98	11,199,994	3,443,581	7,674,065	6.22
1898–99	11,274,840	3,589,494	7,454,000	6.00
1899–00	9,436,416	3,665,412	5,935,499	8.69
1900–01	10,383,422	3,587,828	6,641,281	6.67

A study of the foregoing figures will show that there has been slight increase in price followed by fall in price. In the summer of 1903 the rate went up to 13c. There has also been a steady increase in the cotton crop, with occasional deviations by reason of unfavorable seasons. The average total value of the crop and the average yield per acre since 1875 have been as follows:

COTTON AVERAGES, 1875–1901.

Year	Acres	Total Value of Crop	Net Lb. Per Acre	Bale Per Acre
1875–76.....	11,635,000	$399,445,168	177	0.39⅞
1876–77.....	11,500,000	252,602,340	171½	0.39
1877–78.....	11,825,000	255,768,165	181¾	0.40⅜
1878–79.....	12,240,000	236,586,031	185¼	0.41½
1879–80.....	12,680,000	313,696,452	206¼	0.45½
1880–81.....	16,123,000	356,524,911	188½	0.41
1881–82.....	16,851,000	304,298,744	145⅝	0.32⅜
1882–83.....	16,276,000	327,938,137	200⅝	0.42⅝
1883–84.....	16,780,000	288,803,902	157½	0.34
1884–85.....	17,426,000	297,253,972	150½	0.33
1885–86.....	18,379,444	313,723,080	165¼	0.36
1886–87.....	18,581,012	298,504,215	162½	0.35
1887–88.....	18,961,897	336,433,653	173½	0.37
1888–89.....	19,362,073	344,069,801	167⅞	0.35¾
1889–90.....	19,979,040	373,161,831	173¾	0.36½
1890–91.....	20,583,935	429,792,047	200⅜	0.42
1891–92.....	20,555,387	391,424,716	209⅝	0.44
1892–93.....	18,057,924	284,279,066	176	0.37
1893–94.....	19,684,000	294,495,711	182	0.38
1894–95.....	21,454,000	288,918,504	223	0.46
1895–96.....	18,882,000	292,234,437	181	0.38
1896–97.....	22,341,000	327,547,854	187	0.39
1897–98.....	24,071,000	338,432,458	224	0.47
1898–99.....	23,572,000	282,772,987	232	0.48
1899–00.....	22,583,055	363,773,836	210	0.44
1900–01.....	23,805,629	494,567,549	222	0.43

In 26 years, from 1875–6 to 1900–1, cotton brought into the South more than $8,600,000,000. This sum is so vast that the profits out of it ought to have been enough to enrich greatly the whole section. Unfortunately, however, the system given an impetus by the abject poverty following the War, of putting all energies into the single crop and turning to other sections for provisions and grain, left but little surplus money out of the cotton crop for the cotton farmer during the first part of the period mentioned. The West and the North drained the South of several hundred million dollars every year, because it depended upon them for all of its manufactured goods as well as for the bulk of its foodstuffs. During the past 10 or 12 years, however, diversified farming has become more general, and the raising of home supplies, the development of truck farming and the building of factories of many kinds are combining to

SIXTY YEARS OF COTTON MANUFACTURE.

Year	Capital Employed	Number of Spindles	Cotton Consumed Reduced to Bales of 400 Lbs.	Hands Employed	Wages Paid	Value of Products
1830.....	$44,914,941	1,246,503	184,000	62,208	$12,155,723	$32,036,760
1840.....	51,102,350	2,284,631	340,000	72,119	14,000,000	46,350,453
1850.....	74,500,931	3,633,693	721,393	92,286	17,276,112	65,501,687
1860.....	98,585,269	5,035,798	1,056,762	122,028	23,940,108	115,681,774
1870.....	140,706,291	6,621,571	995,770	135,369	39,044,132	177,489,739
1880.....	208,280,346	10,768,516	1,875,859	174,659	42,040,510	192,090,110
1890.....	354,020,843	14,088,103	2,794,864	221,585	69,489,272	267,081,724
1900.....	460,842,772	19,008,352	3,639,495	297,929	85,126,310	332,806,156

keep at home the money which formerly went North and West.

The destruction by the War of the industrial interests which were developing in the South prevented the taking up by that section of manufacturing undertakings until about 1870–80, when there were marked signs of a tendency toward the building of cotton mills in the South. In the North, on the contrary, the cotton mill business developed very rapidly in the decade following the War. Of late years the chief increase has been in the South. The number of spindles in the whole country at present is estimated at about 21,000,000, and the South has 6,500,000. The progress of cotton manufacturing in the United States by census years since 1830 is shown in the table on preceding page.

The consumption of cotton in northern and southern mills, as reported by the New Orleans Cotton Exchange, has been as follows:

CONSUMPTION OF COTTON IN AMERICAN MILLS IN THE NORTH AND SOUTH.

Crop Years	Northern Mills	Southern Mills
1900–01	1,966,897	1,620,931
1899–00	2,068,300	1,597,112
1898–99	2,190,035	1,399,399
1897–98	2,211,740	1,231,841
1896–97	1,804,680	1,042,671
1895–96	1,600,271	904,701
1894–95	2,083,839	862,838
1893–94	1,601,173	718,515
1892–93	1,687,286	743,348
1891–92	2,190,766	686,080
1890–91	2,027,362	604,661
1889–90	1,799,258	546,894
1888–89	1,785,970	479,781
1887–88	1,804,993	456,090
1886–87	1,710,080	401,452
1880	1,573,997	221,337
1870	806,690	90,000
1860	786,521	178,107
1850	475,702	87,067

The cotton production of the United States, which is now averaging over 10,000,000 bales, or about three fourths of the world's supply, can be indefinitely extended to meet the increasing consumptive requirements of the world. Hon. Charles W. Dabney, late assistant secretary of agriculture, in a careful study of the cotton potentialities of the South, has indicated that this section can, whenever the demand justifies it, produce as much as 50,000,000 bales of cotton without intrenching on the area necessary for diversified agriculture, and that by intensive farming it may some day be possible even to double this. Supplying, as the South now does, about 75 per cent of the world's cotton crop, and thus holding almost a monopoly of this important staple, southern mills, notwithstanding the very rapid growth of recent years, consume only about 15 per cent of the crop. There are about 105,000,000 cotton spindles in the world, of which the United States has about 21,000,000. The consumption of cotton in this country is now about 3,500,000 bales a year, or 35 per cent of the average crop of late years. It has been estimated that the capital invested in the cotton-manufacturing business of the world, which, as stated, depends for at least three fourths of its supply of raw material upon the South, aggregates not less than $2,000,000,000, of which this country has probably about $500,000,000.

There is practically no limit to the possible extension of cotton-growing and cotton-manufacturing in the United States. With the power to increase its cotton crop to 50,000,000 bales, should the world ever demand such a yield, and with every natural advantage for manufacturing, the limit of profitable cotton-mill business in the United States will not be reached until its own mills consume its own production. The increase in the textile industry must naturally centre mainly in the South. Consult: Young, 'The American Cotton Industry' (1903).

Richard H. Edmonds,
Editor 'Manufacturers' Record,' Baltimore, Md.

Cotton Insects. The cotton worm and boll-worm are the chief enemies of the cotton plant in the United States; in other countries different insects prey upon it. Various caterpillars and other insects attack this plant wherever it is grown. In Egypt a noctuid larva, in Greece various kinds of cut-worms, in India a small tineid boll-worm (*Depressaria*), while in Australia a red-bug, allied to the cotton-stainer (*Dysdercus suturellus*) affects it. This insect, by sucking the buds, causes the bolls to blast or become diminutive, and also stains the cotton fibre by its excrement.

The cotton worm is by far the most serious pest. It is the caterpillar of a noctuid moth (*Aletia xylina*), which often feeds in vast numbers on the leaves of the cotton-plant. It has a loping gait; is slightly hairy, green, dotted with black along a subdorsal yellowish line, with black dots beneath, and changes to a pale reddish-brown moth. The insect, as shown by Riley, "never hibernates in either of the first three states of egg, larva, or chrysalis, and it survives the winter in the moth or imago state only in the southern portion of the cotton belt." "The moth," he adds, "hibernates principally under the shelter of rank wire-grass in the more heavily timbered portions of the South, and begins laying its eggs (400 to 500 in number) on the ratoon cotton when this is only an inch or two high." The localities where it hibernates, and where, consequently, the earliest worms appear, seem to be more common in the western part of the cotton belt (Texas), than in the Atlantic cotton States. It is inferred that from this region the moths emigrate east and north, laying their eggs later than the original Texan brood, as in Alabama and Georgia. The recently hatched worms of different sizes were found late in March on ratoon cotton in southern Georgia and Florida, and in late seasons from the middle of April to the middle of May, though they do not attract the attention of planters until the middle or last of June. In midsummer the period from hatching to the time when the moth lays her eggs is less than three weeks, but in spring and late autumn twice that time may be required. There are thus in the northern cotton States at least three "crops" or broods of caterpillars in a season, while in Texas there are at least seven annual generations. The first generation is only local, but in Texas, says Riley, "the third generation of worms may become, under favoring conditions, not only widespread, but disastrous, and the moths produced from them so numerous that they acquire the migrating habit. This generation appears in southern Texas during the latter part of June, and in southern Alabama and Georgia somewhat later," and this is the first brood which attracts general attention. When

the worms are very abundant and the cotton well "ragged," the moths, driven by need of food and with favoring winds, migrate to distant points, and thus spread late in summer, having been seen as far north as Massachusetts and the Great Lakes.

Another insect, destroying great numbers of cotton buds, is the boll-worm, the caterpillar of another noctuid moth (*Heliothis armigera*), well-known for its injuries to tomato and tobacco plants and to corn in the ear. The adult is a tawny, yellowish moth, about an inch and three quarters across the wings, which may be seen toward evening, in summer and autumn, hovering over the cotton blooms, and depositing a single egg in each flower; the egg is hatched in three or four days, and the worm eats its way into the centre of the boll, causing its premature fall; the insect instinctively leaves the boll when it is about to fall, and enters another, and finally attacks the nearly matured bolls, rendering the cotton rotten and useless. The caterpillars have 16 feet, and creep with a gradual motion, unlike the true cotton worm; they vary much in color, some being green, others brown, but all more or less spotted with black, and having a few short hairs. A single moth will lay 500 eggs, and, as three broods are produced in a year, a whole field will be very soon infested with them.

These are the two greatest enemies on the cotton plantations, and the same remedies are effectual in both. The natural enemies of the cotton worms are numerous and abound in proportion as the worms are abundant. Certain kinds of ants are most efficacious in reducing their numbers, as well as ground beetles, bugs, and ichneumon flies (q.v.). The general and most practical remedies against this troublesome pest are the insecticides, especially Paris green and kerosene emulsions. The dry preparation is one pound of the green to from 20 to 35 pounds of cheap flour, or, instead of flour, land plaster (gypsum) or cotton-seed meal. The best preparation of Paris green consists of one pound to 40 gallons of water. London purple may be applied dry, using two pounds to 18 of flour, etc.; or wet, one half a pound to 50 or 55 gallons of water.

A fine spray of kerosene oil applied to the leaves will kill all the worms in a remarkably short time, but as petroleum in any form injures the plant, the oil must be so diluted as to injure only the worm and not affect the plant. The use of milk as a diluent has been suggested.

Consult: Riley, 'Report IV.' of the United States Entomological Commission (1885); and Bulletin 18 of the Entomological Division of the United States Department of Agriculture (1898).

For cotton-boll weevil, see WEEVIL.

Cotton-mouse, a small field mouse (*Peromyscus gossypinus*), native to the southern portions of the United States, and destructive to cotton-plants. It is dark brown in color, with grayish feet. Its habits are like those of the white-footed deer-mouse (q.v.), common in the North.

Cotton-seed-oil Industry. The utilization of one waste product does more to enrich the world than an increase of many millions of dollars of product in some old and well-established industry. Perhaps there is no single thing that more forcibly illustrates this truism than the utilization of the once despised cotton-seed. In the process of ginning seed-cotton the result is a little more than two pounds of seed for every pound of cotton produced; and 40 years ago, aside from the small amount of seed that might be reserved for the next season's planting, and such small quantities as were consumed by the cattle on the plantation, there was absolutely no use to which it could be applied. At the gins the great seed heaps grew, as the sawdust heaps rise to-day around the portable sawmill, until, as a last resort, the gin would be moved from the base of the seed mountain it had reared up to itself. Thus was cotton-seed, in 1840 and 1850, a source of actual expense and an encumbrance. That there was an oil that might be made useful contained in the cotton-seed was known, of course, ever since 1783, when that august and venerable body, the London Society for the Encouragement of Arts, Manufactures, and Commerce, first called public attention to it. The real value of this oil, or a method for its extraction, was, however, not known to the society; and while it declared that the seed-cake resulting from the manufacture of the oil was good cattle-food, and though the society offered gold and silver medals of reward for the first successful process of making the oil and cake, it never had occasion to bestow its honors. Later on, when the seed of the Egyptian cotton was introduced into Europe, the manufacture and refining of the oil was begun and carried on quite extensively. The use of the product for food purposes was also learned abroad before any advance whatever had been made by this country in that direction.

The dilatoriness of Americans in availing themselves of this great wasted asset was undoubtedly due to the fact that the South, where cotton was king, was not a manufacturing community, and had neither taste nor inclination to develop along any but agricultural lines. Her population, further, embraced but few of the operative class needed for the labor of the manufactory. The first recorded attempts in this country to extract the crude cotton-seed oil were made at Natchez, Miss., in 1834, and at New Orleans in 1874. Both were complete failures from the standpoint of practicability, and it was long a lugubrious jest with a well-known citizen of New Orleans, who was active in the second attempt, to show a small bottle of the crude cotton-seed oil, which he stated had cost him just $12,000. Abroad the seed of the Egyptian cotton continued to be used more or less successfully, and experiments — rather desultory in their nature, perhaps — were continued on this side of the water. The greatest difficulty encountered by the pioneers in this field was the total lack of appropriate machinery. Foremost as Americans have been in the invention of mechanical appliances, they were singularly backward in developing machinery for the expression of the cotton-seed oil. At the time now under discussion each mill that was attempted had its own mechanical ideas, and these were uniformly crude and unsuccessful. In fact, the introduction of improved or even fairly practicable methods of extracting and refining cotton-seed oil did not come until some of the American manufacturers — notably Paul Aldigé of New Orleans — had visited the great European

works, including those at Marseilles, and patterned from them, in the early years after the Civil War.

Prior to this, however, the industry had gained a foothold on a small scale, and crude cotton-seed oil was put on the market in limited quantities. Its appearance as a domestic product dates from about 1855,* and to Paul Aldige, of New Orleans, later one of the most prominent cotton-seed-oil manufacturers in the country, is due the credit for the first successful attempt at crushing the seed in a mill. He had to contend with many difficulties, not the least of which was procuring the cotton-seed. The wealthy planters of those ante-bellum days, when their cotton crop was picked, ginned, and baled, were quite disposed to regard the business as completed. To be troubled about selling the waste seed product of the gins was not worth their while; and as the small planter did not exist to any extent, it was more than difficult to secure the needed seed. It was harder to get one ton then than it is to get 100 to-day. Furthermore, the transportation facilities for bringing in the seed from the outlying districts were of the poorest. These obstacles, together with crude machinery and little knowledge concerning the valuable by-products to be obtained from the manufacture of the oil, all operated to keep the industry at the lowest point.

Singularly enough it was in the State of Rhode Island that the first firm foothold for this peculiarly southern industry was obtained. A mill was started at Providence, R. I., in 1855–6, and the seed was shipped from the South, principally from New Orleans. While but a small affair compared with the huge works of to-day, this mill continued to be operated until the outbreak of the Civil War put an end to southern seed shipments. During the years of the War that followed, the cotton-seed-oil industry made little headway here, although abroad it was rapidly coming into prominence. There were a few small mills and refineries in the cities along the Mississippi, notably at Vicksburg and New Orleans; and after the blockade of that river began to shut off supplies, their product came into demand as an illuminating oil, despite the fact that it could not be burned in chimney-lamps. In the accumulation of the seed-cake resulting from this blockade, which prevented all exportation, the South first came to use it, in default of anything better, as a food for cattle. It had never been used for such a purpose here before, although it had been exported, and its valuable properties were well known on the continent of Europe. The hulls, also, were discovered at this time, in the same forced way, to be good food-stuff for cattle, and their use for this purpose, in a limited way in the South, dates from this time. These hulls, mixed with a certain percentage of the meal of the seed-cake, make a compact form of fodder, and were used in the timber regions and other localities where hay was hard to obtain and difficult to transport.

It is not many years ago that every cotton-seed mill in the country utilized, as far as possible, its hulls for fuel to operate the mills; but this demand fell short of the production, and the larger mills were put to an expense for hauling the hulls away or for erecting furnaces to convert them into ashes. Gradually the value of the hull became known to the dairyman, and then to the feeder of stock for the butcher, till at the present time practically all the hulls produced are utilized as cattle-food, and that which was only lately an expense to the crusher has become a source of revenue.

This and many other most valuable by-products were, however, almost unknown here until after the War had ended. In New Orleans and at Vicksburg the crushing of the seed was continued in a small way during the years between 1800 and 1805, when peace, with the consequent return of the people to their agricultural pursuits, again brought larger crops and increased activity. In 1800 there were in the whole United States just seven mills for the crushing of the cotton-seed. Though the diverse usefulness of the cotton-seed oil was manifesting itself almost daily in some new form, the growth of the industry was comparatively slow. Twenty-six mills in 1870 increased in the next 10 years to only 45. These represented a capital invested of $3,802,300, through which was turned out an annual product valued at $7,690,921. In wages the cotton-seed mills in 1880 paid out $880,836 to 3,319 employees, and the value of the material consumed by them in the processes of manufacture was $5,091,251. These figures, while of respectable amount, considered with due allowance for the short time the industry had been known, still sink into insignificance by contrast with those representing its condition to-day. The 15 years that followed 1880 have seen the most wonderful change in the status of the cotton-seed-oil business among the commercial and industrial interests of the country. While the total product of the country in 1880 was less than $8,000,000, that of a single concern, the American Cotton Oil Company, 10 years later, was over $20,000,000, and 5,000 employees were carried on the rolls of this one company.

One of the great factors in this wonderful growth has been the continued bringing to light of new uses and value for the product. What the discovery of the by-products of petroleum did for that mineral oil was done for cotton-seed oil, when the manifold uses of the refined product began to be understood. As an oil, that of the cotton-seed possesses in high degree all the properties common to the best vegetable oils, with the exceptions that for household illumination, or as a lubricant, it cannot be used to advantage. As ordinarily known in the phraseology of the market, refined cotton-seed oil is of four varieties, namely, summer and winter yellow, and summer and winter white. From the summer yellow are derived many valuable products. The well-known lard compound, "cottolene," and similar products, which have so largely superseded hog-lard for cooking purposes, take a great deal of this grade of oil, the bulk of which, in fact, may be said to be consumed in culinary channels. When cheaper than tallow, "summer yellow" is also used in great quantity in the manufacture of laundry and toilet soaps, and a large amount of it, made from selected crude oil, is exported for use abroad in the making of butterine, a substitute for butter much used in Holland, Belgium, France, and other European countries. This grade of oil is of the finest quality, and in many places has supplanted olive-oil as a dressing for salads or the general uses of the table. Druggists find in it a reliable and excellent substi-

tute for olive-oil in many preparations for external application, such as salves and liniments. Not being inflammable, cotton-seed oil is used by the salt manufacturers to float on top of their tanks, and the papermakers find a similar use for it. By a process of bleaching, "summer yellow" is converted into "summer white." "Winter yellow" and "winter white" will stand a cold test at 32° F., without chilling. These oils are produced from the summer oils by extracting a large percentage of the stearine contained therein. Winter oils are largely used as a substitute for whale and lard oils in miners' lamps, and considerable quantities are used in foreign countries. Cotton-seed soap-stock, as known to commerce, is the residuum of the refining-kettle, and is utilized in low-grade laundry soaps and in wool-scouring soaps.

Besides these uses of the refined oils, the crusher of cotton-seed sees his product and by-products bring him returns from various other sources. The cotton-seed cake, or solid residuum of seed remaining after the expression of the oil, finds sale as cake, principally in Great Britain; but by far the larger portion of the cake is converted, by grinding, into cotton-seed meal, which is of such high repute at home and abroad, both as a food for cattle and sheep and as an ingredient of ammonial fertilizers, that the entire production finds a ready sale. The "linters" or short staple cotton, ranking relatively as of about half-value with "middling cotton," is another by-product which the cotton-seed crusher gains through a careful reginning of the seed.

The process of extracting the oil from the cotton-seed is a rather complicated one in its preparatory stages, but is simplified to the last degree by the employment of machinery at each and every step. The seed, on reaching the mill, is first screened, to remove sand, dirt, bolls, and foreign substances, and finally a draft of air is used to complete the cleaning process. The seed is now ready for the linters, which machines are an elaboration of the ordinary cotton-gin; and whatever staple remains upon the seed is stripped off in passing through them. From the linters the seed passes to the huller, a high-speed cutting-machine, which cuts it up most thoroughly. The hulls, by screens and beaters, are now separated from the meats, which latter are, by screw-conveyers, conducted to bins contiguous to roller-crushers, and as fast as required are passed through the crushers, where the mass is reduced to a uniform consistency, and is known to millmen as "uncooked meal." The first step is cooking this meal, which is done in steam-jacketed kettles. When heated to a proper degree the meal is drawn from the kettles, formed into cakes, enveloped in camel's-hair cloth, and placed in boxes of an hydraulic press, when by the application of proper pressure the crude oil is speedily extracted. The solid residue remaining in the press-box is the decorticated cotton-seed-oil cake of commerce.

In the practical methods by which these mills are supplied and operated all the improvements of modern industrial enterprise have been laid under tribute. In the distribution of the oil product, tank-cars on the railroads and tank-steamers on the high seas are used for transportation in bulk; and the American Cotton Oil Company, in its immense export business to Rotterdam, has a tank-steamship capable of carrying 4,200 tons of oil in bulk, thus saving the heavy item of cooperage. This steamer can thus carry, without injuring, even the finest quality of the food-oil, which is in great demand in Holland and Belgium. As an evidence of the amount consumed there it is shown that Rotterdam alone imported in one year, recently, no less than 8,356,676 gallons of cotton-seed oil, of which 5,973,760 were from this country. The diversity of the industry requires factories other than the crude-oil mills, as refineries, lard and cottolene plants, soap factories, cotton-ginneries, cotton-compressors, and fertilizer-mixing establishments. The supply for all these is derived directly from the crude-oil mills, which in their turn are operated immediately from the raw material, in providing which there has grown up a most important branch of the agricultural system of the South.

With the development of the industry in later years have come, of necessity, radical changes in the methods of collecting the seed and covering the country. The commission merchant, who, in the early days after the War, did almost all the business for the large cities, has disappeared. With New Orleans as a centre for the large milling interests, these seed buyers formerly laid only the Mississippi River bottoms under contribution for their annual supply. They acted as middlemen, and to them the mills sent as many bags as they desired to have filled for their season's supply. These bags were in turn sent out by the agents to the planters to be filled, and on their return were forwarded to the mills, where they were reweighed, inspected, and, if found defective in any way, a charge was entered against the commission merchant, who was furthermore responsible for the bags, and was duly charged with any shortage of return. As the mills increased, however, and competition became keener, buyers from the various great concerns supplanted the commission merchant. They represented their particular mills, and scoured great districts of the cotton-growing sections, hundreds of miles distant, buying up all the seed they could find. This arrangement entailed upon the mills the necessity of direct dealing with the planters, which sometimes has resulted in more or less pecuniary loss. Where 25 years ago the commission merchant stood between the mill and short weight, poor-quality seed, or shortage in the bags, there is no one to do so to-day, and the petty losses in the individual dealings make up an aggregate sum that adds materially to the annual expense account.

As collections are now made, everything has been systematized to a point that insures the greatest possible expedition of business. In the small inland towns the seed is brought in entirely by wagons, drawn by the inevitable southern mule; and every Saturday morning during cotton-picking time a long string of these wagons can be seen waiting in the sun outside the seed depot to be weighed and unloaded. All is grist that comes to a cotton-seed buyer nowadays; that is, until he begins to grind. Foreign substances and poor-quality seed mix with the wagon load, and are shoveled in to him at the same market price as the good product. He has no time to object, as the early cotton-seed grinder would most certainly have done. He now knows the machinery in the mill will sort all that mass of seed as intelligently as he him-

self could do it, and with infinitely more rapidity. He knows that he and his colleagues are now buying from 1,250,000 to 1,500,000 tons per year, where a few thousands only were bought 25 years ago, and if the expediting of this vast business involves some increased expense, it must be borne. This buying in bulk is also practised where the seed is transported by rail to the mills. Immense tracts are laid under contribution in this way, and remote districts reached by the mills in their ever-extending hunt for the seed. Much of the product brought in by the railroads is transported for several hundred miles, and statistics place the average expense to the mills of this single transportation item at $2 per ton, which, supposing that only one half the total seed-supply was carried over the railroads, would run into large figures.

The third and most favored method of collecting the cotton-seed is by boat along the rivers. In this form of collection it is found necessary to sack the seed, and for this purpose the mills supply the bags. A steamboat carrying several thousands of empty bags will leave New Orleans or Vicksburg, as the case may be, and steaming slowly up the river, stop at each small town and at the various plantations along the levees. At each stopping place as many bags are left as each planter thinks he can fill; and when the last bag has been given out, the steamboat is turned and headed down the river to pick up the freight by the dozen or by the hundred bags as it returns. The great drawback to this system is that the bag used for cotton-seed is altogether too popular an article among the planters. The planters to-day are small holders, and for the most part negroes, to whom a cotton bag has a varied utility that would scarcely be believed at first sight. It makes an excellent pair of trousers or a coat for plantation work, a good saddle-cloth for the road, and can even be found as bedding in not a few of the houses along the levees. That the loss entailed in this seemingly petty way is really a heavy one may be gathered from the fact that the mills have had a shortage of as many as 1,500,000 bags in a single season.

The effect upon the cotton-growing interests of the South of the great industry that has sprung up from this seed has been undoubtedly great. In the face of a declining market the total production of the plantations has more than tripled during the past 32 years. A crop of 3,154,946 bales in 1870 had increased to a total production of 10,979,805 bales in 1902. Cotton-seed oil solely, has not been, of course, responsible for this advance, nor is such a claim advanced. It can be stated, however, that since the small planter, with his 5- to 10-bale crop, became common throughout the cotton belt, the additional revenue which he has been able to derive from the sale of the cotton-seed has done much to aid his progress.

The quality of the cotton affects little or not at all the quality of the seed, and soil so poor as to yield a hardly marketable cotton will still grow a plant whose seeds are as good as the best. In the making of the cotton-seed oil there has already been utilized a large amount of the seed of the almost worthless "bumblebee" cotton. This cotton is stunted, either from poor soil or lack of cultivation, and grows so near the ground that only the very smallest negro children, known as "bumblebees," are able to pick it without becoming exhausted by stooping. Finally, when it is considered that the seed of the cotton-plant more than pays the entire expense of ginning, baling, and tying the crop, the economy it effects is plainly seen. Even the slave labor of the ante-bellum days cost its own maintenance, and, little as that cost was, the financial interests of the plantation to-day are better served because of the added value of the seed. In fact, the whole agricultural life of the South has been benefited by this formerly despised gift of old King Cotton, and it is only just to say that the people are becoming appreciative of this fact.

To return to the history of the industry from the point at which we left it in 1880. The 15 years which have intervened between then and now have formed the period in which cotton seed crushing may fairly be said to have taken its place among the great American interests. Forty-five mills in 1880 had increased to 60 within two years, or at the rate of 33⅓ per cent. Since then the increase has been steady, both in the number of mills and in the capacity of those already in operation. In 1890 there were 119 establishments, and this number exactly tripled in the decade following. The average consumption of seed per establishment for the year ending 31 May 1900 was 6,945 tons.

The prejudice against cotton-seed oil — so rampant in the early eighties as to induce Spain at that time to begin a war against its importation, in which Italy, moved to the defense of her olives, speedily joined — has largely disappeared. Since 1889 the exportation of cotton-seed cake and meal has become an important item of our foreign trade, and one which bids fair largely to increase. The amount exported in 1902 was 735,757 tons, about four times the amount exported in 1892. Likewise the exports of cotton-seed oil in 1901 were 49,356,741 gallons against 11,003,160 gallons in 1891. The value in 1901 of this export was $16,541,321 against less than $4,000,000 exported in 1891.

In the year 1900, with a cotton crop of nearly 10,000,000 bales, there were about 2,500,000 tons of seed crushed. This means that at least $25,000,000 were distributed among the planters of the South in cash payments for cotton-seed; the railroad and transportation companies received as much more in freights. From this resulted a product approximating 93,000,000 gallons of crude cotton-seed oil, besides about 900,000 tons of oil-cake and meal. Wages and the legitimate expenses of the industry further circulate millions annually. Its prosperity reacts beneficially upon the country, and its product adds to the comfort and conveniences of the time. With it the South takes her place among the other sections in the manufacturing interests which will bring wealth to her and commercial honor and credit to the American nation.

THOMAS R. CHANEY,
Ex.-Pres. American Cotton Oil Co.

Cotton State, a nickname for Alabama.

Cotton Supply of the World. Of the cotton now consumed by the mills of Great Britain, continental Europe and the United States, about 80 per cent is the growth of this country. In the five years ending 31 Aug 1860, the average proportion was 84½ per cent. The high prices resulting from our Civil War and the disorgan-

ization of the agricultural interests of the South, which continued for some years thereafter, induced such an increase of cultivation in other countries that it was not until 1882 we furnished as much as 75 per cent of the total consumption of the mills of Europe and the United States. For the five years ending with 1890 we furnished within a fraction of 77 per cent; in the five years ending with 1895 we had increased our proportion to 79½ per cent, and for the five years ending with 1900 we had furnished to the mills of Europe and America 83⅓ per cent of their entire takings of cotton.

We have now regained our absolute supremacy in the field of cotton production, and an impartial consideration of the entire situation fully justifies the belief that we will retain it indefinitely. Our chief competitors in cotton production for the European markets are India and Egypt. In the year ending 30 Sept. 1902 the deliveries of cotton to the spinners of Great Britain and continental Europe were 8,292,000 bales, consisting of 6,404,000 bales of American, 759,000 of East Indian, 772,000 of Egyptian, and 357,000 from Brazil, Peru, Turkey, and all other countries. Taking into consideration the weight of the bales of each country, the proportion of each growth was about as follows: American, 77 per cent; Egyptian, 14 per cent; East Indian, 7 per cent, and the total of all other kinds, 2 per cent.

The consumption of cotton by the mills of India has increased from 34 per cent of the crop in 1882 to 59 per cent of the crop of 1898, the latter being the largest crop recorded. The crop of India in 1881 was 2,390,000 bales, of which 814,000 bales were consumed in the country. In 1898 the crop had increased to 3,502,000 bales, and the home consumption to 2,088,000 bales. While the production had increased during this period 1,112,000 bales, or 46½ per cent, the home consumption had increased 1,274,000 bales, or 156½ per cent. The exports of cotton from India had decreased, however, from 1,576,000 bales in 1881 to 1,414,000 in 1898. The largest annual exports of cotton ever made from India were 2,023,000 bales in the season of 1871–2. During the season of 1901–2 the total exports were 1,618,000 bales, including 860,000 to Japan and China, while in the season of 1899–1900 the entire exports were only 303,000 bales to Europe and 607,000 to Japan and China. Of the total deliveries of cotton to European spinners during the five years ending in 1865, India furnished an average of 45 per cent. During the five years ending in 1875 India's proportion of the deliveries to Europe had fallen to 26 per cent. In the five years ending with 1885 it had fallen to 20 per cent, and in the five years ending in 1895 to 13 per cent. In the five years ending with 1900 the proportion had dropped to 7½ per cent.

There is in India an abundance of suitable land which could be added to the area now devoted to cotton, and while some extension of cotton cultivation may be expected, it seems quite evident that the increased production will be fully absorbed by the growing requirements of the Indian cotton-mills. The general uncertainty in regard to the rainfall and its actual insufficiency in many sections of India are serious drawbacks to any considerable increase in cotton cultivation, especially when it is considered that the average yield per acre is only about 75 pounds of lint cotton of a quality and market value much lower than American cotton.

In China cotton is grown in a small way by a great many people who grow other crops as well, but it is rarely, if ever, made an exclusive crop, and no statistics are obtainable of the quantity actually grown. With the exception of a small quantity exported to Japan, it is all consumed in China, none having been exported to Europe since 1867. The production of China and Korea is estimated as equal to about 1,300,000 bales of 500 pounds net. The quality of Chinese cotton is undesirable, the staple being coarse and harsh, and quite short.

The formal opening, 9 Dec. 1902, of the newly constructed irrigation works at Assouan and Assiout on the Nile has attracted attention to Egypt as a source from which increased supplies of cotton might be expected. Egypt is an almost rainless country, the average yearly rainfall at Alexandria for the last 30 years being only about eight inches. No crops of any kind can be grown without irrigation, and the river Nile is the only source of water supply. The cultivable soil of Egypt consists only of the land which can be reached by the water of the Nile. Beyond this limit there is only a barren waste of sand and desert utterly impossible of cultivation. The cultivable portion of Egypt is embraced in the delta of the Nile and the valley of the Nile, comprising together about 6,000,000 acres. The Nile delta is a triangular-shaped section of land, having its apex at the old irrigation works near Cairo, and its base on the Mediterranean, between the Rosetta and Damietta branches of the Nile. The valley of the Nile runs along the river from Cairo southward, and is quite narrow, ranging from five to nine miles in width — a mere strip of green verdure in a desert of sand. From the conditions existing in Egypt a "low Nile" therefore, has always meant small crops, and a failure of the annual flood a failure of the crops. The chief purpose of the new irrigation works was undoubtedly to safeguard the crops of the land already under cultivation. (See ASSOUAN.) There will be some extension of acreage, but this will be chiefly in upper Egypt, where the cotton is much inferior to that of lower Egypt, and brings a considerably lower price. The best opinion is that the increase in acreage will be gradual, as it will depend upon the construction of canals to take the water to the new fields.

There are people who think the new irrigation works will cause an addition of 25 per cent to the cultivable land of Egypt. I am not so sanguine about it, though such an increase may be reached some years hence. About 1,800,000 acres are now given to cotton, but wheat, barley, maize, rice, sugar, tobacco, beans, onions, and other crops are grown. The system of rotation of crops is general, and the new acreage, like the present, will be devoted each year to the crop which then promises to be the most profitable. Less than a third of the cultivated land of Egypt is now devoted to cotton, and it is unlikely that cotton will get this proportion of the increased acreage.

Assuming, however, an increase in the acreage of 1,500,000 acres, and that cotton will get a third of it, or 500,000 acres, this would

add about 250,000 bales to the present cotton yield of Egypt. This would probably mark the maximum of the Egyptian cotton crop for some years to come, and it would not be so large in the seasons when other crops promised a greater profit. Egyptian cotton commands a much higher price than our upland cotton, because of its special adaptability to certain purposes and the comparatively small crops which are grown. Should the supply be largely increased, however, the price would inevitably decline, and this would naturally curtail the production.

As much has been written recently respecting the increase in cotton cultivation in Egypt, a comparison of the Egyptian crops with those of the United States discloses some facts of interest. As practically the entire cotton production of Egypt is exported, it is usual to take the total exports as representing the commercial crop of each season, and therefore each season's exports from Egypt will be compared with the commercial crop of the United States for that season. In the season of 1873–4 the United States crop was 4,130,000 bales, and the last crop (1901–2) was 10,708,000 bales, showing an increase of 6,638,000 bales, or equal to 160 per cent. The Egyptian crop of 1873–4 was 410,000 bales, and that of 1901–2 was 859,000 bales, showing an increase of 449,000 bales, or 110 per cent. In the season of 1897–8 the United States crop had grown to 11,216,000 bales, being an increase of 7,086,000 bales over the crop of 1873–4, while the Egyptian crop had increased to 843,000 bales, being 433,000 bales in excess of the crop of 1873–4. During the entire period under review the largest commercial crop of the United States was that of 1898–9, which exceeded the crop of 1897–8 by a few thousand bales, while the largest Egyptian crop was that of 1901–2. The percentages of increase in Egypt look very large and compare favorably with the United States, but in actual results the progress of cotton cultivation in Egypt is a mere bagatelle compared with the enormous increase in actual production in our country. Percentages are very misleading. The increase in production in America since 1873 has been 7,000,000 bales, while the increase in Egypt during the same period has been only 433,000 bales. It is the actual cotton alone which can keep the spindles of the world at work, and the matter of increased percentages of production in any country is merely an academic question of no practical importance whatever.

The equivalent of about 200,000 bales of 500 pounds is now grown in Brazil, but the greatest part of it is consumed in Brazilian cotton-mills, the annual export being sometimes only about 50,000 bales. While there is a vast quantity of land in Brazil suitable for cotton, and the yield is good, the rainfall is too great near the coast, while in the interior it is uncertain, and in many sections entirely insufficient. The conditions are, therefore, not favorable for an extension of cotton culture in Brazil beyond the increasing requirements of its cotton-mills, and especially as there are other crops better adapted to the country and doubtless more profitable.

In Mexico and Japan cotton is grown to a limited extent, but the entire production is consumed in these countries. Peru, Greece, Turkey, and Persia each grow a limited quantity of cotton, but their combined contribution to the European supply is so small as to be scarcely worthy of consideration. There is no probability of increased production in either of these countries.

Since 1889 very energetic efforts have been made to increase the cultivation of cotton in the Asiatic provinces of Russia, and the government has aided the movement by the construction of irrigation works and the imposition of a higher duty on cotton imported into the empire. From a production in Turkestan, etc., equivalent to about 100,000 bales of 500 pounds net in 1889, a total of 344,000 was reached in 1897 and 414,000 in 1899, that being the largest crop grown. In 1898 the crop was 255,000 bales, being the same as in 1892, while the crop of 1901 was 354,000 bales. This cotton is all consumed in Russia, and takes the place of that much cotton which would otherwise have been imported from America, India, and Egypt. The Turkestan cotton is nearly all grown from American seed, and the description is generally of excellent staple and quality. As the season for maturing and picking is rainless, the cotton is usually bright, clean, and of good color. The cotton grown from native seed is quite similar to India cotton, the staple being harsh, uneven, and brittle, and only about five eighths to three quarters of an inch long. There is rarely any rain from 10 April to 1 November, and the needed moisture for the crops is supplied from the rivers by means of irrigating canals. Labor is in ample supply, and cheap. Except along the watercourses, the land in Turkestan is for the most part composed of mountain ridges or sandy plains, and in consequence of the insufficiency of rainfall during the season of growth, cotton cannot be produced anywhere without the aid of irrigation. If all the cultivable strips of land in the Asiatic provinces of Russia could be placed together they would about equal the area of North Carolina, but of necessity by far the greater part of this territory must be devoted to food crops. From the facts presented, it looks as if the limit of cotton production had been reached in Turkestan until more extensive irrigation works are constructed by the Russian government. Even then, in view of the limited area of suitable land, it is doubtful if the production of cotton in Russia's Asiatic provinces will ever be sufficient to fully meet the requirements of the Russian mills. It is very questionable if the increase in production will keep pace with the increase in the consumption of cotton by the Russian mills. I am confident it will not exceed the increasing requirements of the mills.

I think I have now reviewed with perfect fairness the probabilities of an increase of the production of cotton in all of the foreign countries in which it is now cultivated as a regular crop. The conclusion reached is that except for a small increase from Egypt, no greater contribution to the cotton supply of Europe can be expected than at present. It is quite possible to grow cotton in many countries in which it is not now cultivated, but whether it can be produced in large quantities and at low cost, and as profitably as the other crops which it would replace, is a very different matter.

There are vast possibilities for the extension of cotton cultivation in the United States. According to the last United States census, there were in 1899 in Louisiana, Texas, Arkansas, Indian Territory, and Oklahoma 40,000,000 acres

of improved land, of which 10,600,000 acres were devoted to cotton. New land is being constantly brought under cultivation in each of these States and Territories, and the soil is the most productive in the cotton belt. These five States and Territories have the requisite area, soil, and climate to enable them to produce as much cotton as is now grown in the entire country. To my mind, it is only a question of time when this will be done. It may be urged that the laboring population now in this territory would be insufficient to cultivate such increased crops of cotton in addition to the necessary food and forage crops. Without discussing this matter, it need only be stated that the population is increasing rapidly, and that labor is invariably attracted to the fields where it is most needed. The southern States of this country will stand between Europe and a cotton famine.

ALFRED B. SHEPPERSON,
Cotton Statistician.

Cottontail. See RABBIT.

Cotton Whigs, or **Conscience Whigs.** See WHIGS.

Cotton-wood, a species of *Populus*, belonging to the willow family (*Salicaceæ*). There are two very common species in this country, *P. monilifera* and *P. angulata*. Besides these there are some 10 others, which occur under the names of poplar and aspen. The cotton-wood is a large tree, found along the banks of rivers from Florida northward to Quebec and the Northwest Territories, and westward in the United States to New Mexico and Colorado. The wood is soft and weak, of a dark brown color, and weighs about 24 pounds to the cubic foot. It is also known by the names of Carolina poplar and necklace poplar.

Cotton-worm. See COTTON INSECTS.

Cottonian Library, a valuable collection of ancient manuscripts, books, and coins, begun by Sir R. Cotton (q.v.), and much augmented by his son and grandson. His grandson Sir John wishing to make the library a public one, an act of Parliament was passed in 1700 for this purpose; in 1707 another act authorized the purchase of Cotton House and library on behalf of the queen and her successors; and in 1730 it was deposited in a house in Westminster. The next year a fire broke out there, whereby 114 volumes of manuscripts were burned, lost, or entirely defaced, and 98 rendered imperfect. It was then removed to a new building in Westminster, and in 1753 finally removed to the British Museum.

Cottonmouth, a common name in the southern States for the moccasin (*Ankistrodon piscivorus*), so called because of the whitish streak along the lips. The name is also sometimes applied to the copperhead snake (q.v.).

Cottony Cushion Scale. See SCALE INSECTS.

Cotyledons, kŏt-ĭ-lē'dŏnz, the seed-leaves or seed-lobes of the embryo plant, which serve it as organs of nutrition until the young vegetable is established in the soil and develops its true leaves. In flowering plants there are two kinds of embryos — one in which there is only a single cotyledon, and the other in which there are two cotyledons. This difference, being associated with several others of an important character, serves as the basis for the primary division of phanerogamic, or, more accurately, of angiospermous plants into monocotyledons and dicotyledons. The lower class of plants producing spores or cellular embryos having no cotyledons are called acotyledonous. On germination the cotyledons either serve as foliage-leaves or remain underground as fleshy lobes.

Cotylosauria, kŏt-ĭ-lō-sâ'rĭ-ạ, the most ancient of reptiles, from which, as is claimed by the American naturalist, E. D. Cope (q.v.), and his adherents, sprang the saurian and snake-like species of later ages. Their remains are among the characteristic fossils of the Carboniferous Age.

Coucal, koo'kạl, or **Lark-heeled Cuckoo** (*Centropus*), a genus of common bush-birds in Africa, India, and through the Malayan Archipelago to Australia. The hind toe is prolonged into a very long spur. The 35 known species constitute the sub-family *Centropodinæ* of the cuckoo family (*Cuculidæ*). One species is held in religious veneration in Madagascar.

Couch. See QUILLER-COUCH, ARTHUR THOMAS.

Couch, Darius Nash, American soldier: b. South East, Putnam County, N. Y., 23 July 1822; d. Norwalk, Conn., 12 Feb. 1897. He graduated at West Point 1846, served in the Mexican and Seminole wars, and resigned from the army in 1855 to engage in business. During the Civil War he was commissioned brigadier-general 1861; commanded a division in the battles of Williamsburg, Fair Oaks, and Malvern Hill; promoted major-general July 1862, and took part in Pope's retreat and the battle of Antietam. At Fredericksburg and Chancellorsville he commanded the Second Army Corps; organized the Pennsylvania militia to resist Lee's invasion 1863, and took part in the battle of Nashville and the North Carolina operations 1864–5. In 1865 he was unsuccessful as the Democratic candidate for governor of Massachusetts; and was collector of the port of Boston 1866–7. He removed to Connecticut soon after, and was adjutant-general of that State 1833–4.

Couch-grass (a corruption of quitch-grass and quick-grass), a perennial grass (*Triticum repens*) of the same genus as wheat, and one of the most common and troublesome weeds of agriculture. When it first appears above ground its blade is readily eaten by sheep. In arable land, under any tolerable management, the seeds are never allowed to ripen, and the propagation is effected by the numerous joints of the long trailing rootstock, each joint sending forth a shoot which becomes a new plant. The proper time for extirpating it is in summer, when the land is undergoing a pure fallow, or, where fallow is not used, when the land is being prepared for a root-crop. The most effectual means are a deep ploughing, going below the roots of the plant, a diligent use of the roller, grubber, and ordinary harrows, and careful hand-picking. The rootstock may be used as food for various domestic animals, or, when prepared, as a medicine. The root is pulled up by the Germans and cut into small fragments and sold largely to venders of patent medicines. It has a large amount of gum which renders it somewhat demulcent, but its medical properties are nil,

although enormous quantities of it are used in the United States by manufacturers of quack medicines.

Coucy, koo-sē, **Raoul**, rā-ool, or **Renaud**, re-nō, **Châtelain de**, French chevalier; hero of a tragic story often celebrated in ancient ballads and songs, sometimes in connection with other names than his. He was in love with Gabrielle de Vergy, lady of Aubert de Fayel, and dying in the Holy Land, he directed his faithful squire to enclose his heart in a casket and carry it to the Lady of Fayel. He was surprised by the lord of the castle, who found out on what mission he came. Burning with rage, and determined on revenge he ordered the heart to be served at table. The unhappy woman, having eaten, was told the nature of this horrible meal, whereupon she refused all sustenance, and died of voluntary starvation. Uhland has made this story the subject of a fine ballad.

Couder, Louis Charles Auguste, loo-ē shārl ō-güst koo-dā, French painter: b. Paris 1 April 1790; d. there 23 June 1873. He studied in Paris under David, and later in Munich. Among his works are: 'Cæsar on the Ides of March'; 'The Battle of Lawfeld'; 'The Opening of the States General, 1789'; and 'The Siege of Yorktown'; the last three are at Versailles.

Coudersport, kow'dĕrz-pōrt, Pa., a town and county-seat of Porter County in the northern part of the State, on the Allegheny River, and on the Coudersport & Pennsylvania Railroad. It has a foundry, a tannery and other manufacturing establishments. Pop. (1900) 3,217.

Coudert, koo-dĕr', **Amalia Küssner**, American artist: b. Terre Haute, Ind., 26 March 1873; married Charles Du Pont Coudert 3 July 1900. She is one of the most distinguished of living miniature painters, beginning her artistic career in New York in 1892. She went to London in 1896 and painted King Edward (then Prince of Wales), and many leading members of the nobility; in 1899 received a summons to Russia to paint portraits of the emperor and empress, and the Grand Duchesses Vladimir and Ellen; and the same year went to South Africa to paint a portrait of Cecil Rhodes.

Coudert, Frederic René, American lawyer: b. New York, 1832; d. Washington, D. C., 20 Dec. 1903. He was graduated at Columbia College in 1850, and admitted to the New York bar in 1853. In 1892 he was appointed one of the counsel on the part of the United States before the Bering Sea Tribunal of Arbitration in Paris, and was specially complimented by Baron de Courcel, president of the tribunal, for his argument on the necessity of putting a stop to pelagic sealing. On 1 Jan 1896, President Cleveland appointed him a member of the Venezuela Boundary Commission. He had a world-wide reputation as an advocate and authority on international law, and several times declined appointment to the bench of the United States supreme court. He was the legal representative of the French government in the United States for many years.

Coues, kowz, **Elliott**, American naturalist: b. Portsmouth, N. H., 9 Sept. 1842; d. Baltimore 26 Dec. 1899. In 1861 he graduated from Columbian University, Washington, D. C., and the year following entered the United States army as a medical cadet. His thorough work as assistant surgeon in the army, 1863–81, attracted attention, and for that and other services he was brevetted captain. For some years he continued to practice surgery or teach its science; but he also continued to pursue the study of zoology, begun while in the university. In 1873 he was appointed surgeon and naturalist for the United States commission which defined the northern boundary. For three years he remained connected with this commission, and in addition gave some assistance to the Smithsonian Institution. In 1877 he was called by the Columbian University to take charge of a department of anatomy, and later was appointed by the Virginia Agricultural and Mechanical College as professor of biology. He was associate editor of 'The American Naturalist' and other periodicals; and edited, for the Century Dictionary, the departments of comparative anatomy, biology, and zoology. He was one of the founders of the American Ornithologists' Union, and an active member of many scientific societies in Europe and America. He was president of the board of control of the American branch of the Theosophical Society of India. His last years were given chiefly to the Smithsonian Institution. He has left a large number of valuable works on mammalogy and ornithology, some of which are: 'Key to North American Birds' (1872); 'Field Ornithology' (1874); 'New Key to North American Birds'; 'Birds of the Northwest' (1874); 'Fur Bearing Animals' (1877); 'Birds of the Colorado Valley' (1878); 'New England Bird Life' (1881); 'Check List of North American Birds' (1884); 'Biogen' (1884); 'The Dæmon of Darwin' (1884); 'Our Native Birds.'

Cougar, the great American cat (*Felis concolor*), which ranges from Hudson Bay to Cape Horn, a remarkable distance for any wild animal. It was formerly called panther by the settlers of the eastern States; but in the West it is usually called "mountain-lion" or "puma," the latter name said to be of Peruvian origin. "Cougar" comes from a native Brazilian name. The cougar is from six to eight feet long from the tip of the nose to the tip of the tail. The cubs are apt to be spotted and marked; but this wears off with the advent of maturity; and, after the first year, the animal is a uniform reddish, tawny color, deepening in tone toward the spine, paler around the eyes, and whitish on the throat, legs, and under portion. The color is so much like the hide of the Virginia deer that at a distance hunters have been known to mistake a cougar for a deer. This is one of the creature's great advantages as a beast of prey. He may be mistaken by his intended victims for an animal of their own kind, and thus is enabled to get into their midst before his identity is disclosed. In South America he is sometimes called, on this account, "false deer." The head of the cougar is rounded, and the face is extremely intelligent, but crafty in general expression. The facial muscles can be drawn into as ferocious an expression as that of any of the great jungle felines of the Old World. It is said to be more cowardly and less dangerous than the other large carnivores; and it is asserted by authorities in good standing that it generally flees from man except in defense of the young, when the female becomes desper-

ately brave. The puma will prowl about lone camps and logging-huts from curiosity or hunger, but rarely ventures on offensive warfare with humanity. This imputation of cowardice is denied by certain people, notably J. Hampden Porter, who says "there is no need to argue the question whether or not pumas will kill men; that has been affirmatively settled by facts"; and Theodore Roosevelt says, in his 'Hunting Trips of a Ranchman': "When hungry, a cougar will attack anything it can master."

Though plentiful a century ago, in the eastern United States, the cougar is met with rarely, if at all at the present time, east of the Alleghanies. It may still be found in the Appalachian ranges and in the wilder parts of the Middle West. It is so troublesome to ranchmen that, especially in southern California, western Oregon, and various other districts, a constant war, tending toward extermination, is waged upon the species by owners of cattle and sheep. In common with all cats, large and small, the cougar hunts preferably at night. Merriam says that it creeps to leeward of its intended victim; and, with noiseless tread and crouching form, passes over fallen trees and ragged ledges or through tangled thickets, until, if unobserved, within 30 or 40 feet of its quarry. Then it springs upon the back of the victim, plants its long claws in the quivering flesh, and with its sharp teeth despatches its prey. Deer, rabbits, ground-squirrels, ground-nesting birds, and even porcupines form part of its food. It will even catch and eat fish. But best of all it likes the flesh of young ponies, or even of full-grown horses,—a delicacy unknown to its bill-of-fare before the advent of the white race. When it has killed its quarry, the cougar drags it away to eat what appetite demands in the seclusion of its chosen covert; and, when its meal is finished, lies down beside the bloody remnant of its feast, and sleeps. This habit of napping when gorged has procured many a cougar its death at the hands of hunters, who track it by the blood and body of its victim.

The cry of the cougar is said to be one that will carry terror to the stoutest heart,—"a cry that can be likened only to a scream of demoniac laughter," in the male; and in the female, to "the wail of a child in agony." These cries, never heard by day or in captivity, are doubted by some as being so terrible as, heightened by the darkness and the silence of the night, they seem to the lonely hunter. In winter cougars congregate in the valleys of the western mountain regions and raid corrals for sheep and cattle, doing much damage. These depredations are so extensive and constant in Mexico as to be a serious menace to the business success of the ranchmen.

When very young the cubs are playful and kittenish, and may be readily tamed. Indeed, many experiments of this sort have been tried, and the records of such afford interesting reading. But with maturity they develop treacherous qualities which usually render them unsafe for human society. Cougars are often hunted with dogs, and any sort of dog, it is said, will do to scent them. They are not, however, creatures of the chase for sport, as are lions and tigers; but are usually hunted as vermin. When pursued by dogs they take to trees, and are kept there until the hunters come up, when they are easily shot. On the plains of South America they are frequently caught with lassoes by the mounted cattle-herders.

The cougar was held in religious veneration by the Indians of California, as was the tiger by certain sects in India; hence the redmen did not dare to kill the beast, and it multiplied accordingly. Among the Zuñis it is regarded as the chief "prey-god."

Cough, in physiology, a deep inspiration of air, followed by a sudden, violent, and sonorous expiration, in a great measure involuntary, and excited by irritation of the air-passages, due to the presence of some foreign material or irritation of the nerves distributed to the respiratory organs. The organs of respiration are so constructed that every foreign substance, except atmospheric air, offends them. The smallest drop of water entering the windpipe is sufficient to produce a violent coughing, by which the organs labor to expel the irritating substance. A similar effect is produced by inhaling smoke, dust, etc. The sudden expulsion of air from the lungs is produced by the violent contraction of the diaphragm and the muscles of the breast and ribs. The contraction of the muscles is due to impressions reaching them by their motor nerves, such impressions coming from the nerve-centre in the medulla, thrown into activity by stimuli received from the irritated sensory nerves of the air-passages. The sensation of obstruction or irritation, which gives rise to cough, though sometimes perceived in the chest, especially near the pit of the stomach, is very often confined to the trachea, or windpipe, and especially to its aperture in the throat, termed the glottis. Of the various irritations which give rise to cough, some occur within the cavity of the chest; others are external to that cavity; some exist even in the viscera of the pelvis. Of those causes of cough which take place within the chest, the disorders of the lungs themselves are the most common, especially the inflammation of the mucous membranes. Here the cough may be a dry one, that is without expectoration, and this occurs in the early stage of the affection, or a loose cough attended by expectoration, as in the later stage. In the former case it is due to the dry inflamed mucous membrane being very irritable, so that the cough is excited even by the coldness of the inspired air. In the latter case the presence of the defluxion causes the cough and thus excites its expulsion.

Pleurisy, or inflammation of the serous membrane which covers the lung and lines the interior of the chest, also gives rise to cough, this disease being almost invariably accompanied by inflammation of the outer layer of the tissue of the lung. It may be simple, but is very frequently associated with tubercular phthisis. Another common cause of cough which has its seat in the chest is inflammation of the lungs. In this disease there is inflammation of the tissue of the lungs, with exudation of fibrin, which solidifies the lung and shuts up the air-cells. Much constitutional disturbance accompanies it. In the progress of the disease the exuded material softens, and, being swept up the air-tubes, irritates the passages and brings on the cough by which it is expelled. In such a case the cough is desirable rather than the reverse, since it is nature's method of sweeping out the foreign substance from the air-cells and tubes. Another

frequent origin of cough is the rupture of some of the blood vessels of the lungs, and the consequent effusion of blood into the cells, which is expelled by the cough that its irritation excites, constituting what is technically termed, hæmoptysis, or spitting of blood. Cough is also excited by the existence of tubercles in the lungs, one of the most frequent causes of consumption; and by cancer and growths in the lungs.

Then the irritation may arise at the back part of the throat, no disorder being present in the windpipe, bronchial tubes, or lungs. Thus a long uvula, by tickling the back of the throat, may be the cause of a most persistent dry cough, coming on specially when the person lies down. Enlarged tonsils, a chronically thick condition of the mucous membrane of the back of the throat, small growths or polypi in this neighborhood or in the box of the windpipe, may maintain a most troublesome cough. Direct irritation of the nerves connected with respiration, as by the pressure of a tumor, the pressure, for example, of an aneurism in the chest on one of the nerves of the larynx, may excite spasmodic cough of a suffocative kind. Again, cough is very often excited by reflex irritation, the seat of the irritation being a long way from the air-passages. Where a cough is excited by disorders of parts external to the cavity of the chest, it is generally dry, as the irritating cause is external, and not any obstructing matter in the lungs themselves. Disorders of the viscera of the abdomen, especially of those which lie in contact with the diaphragm (the muscular curtain separating the cavities of the belly and chest), frequently induce a cough. A short, dry cough invariably attends inflammation of the liver, whether acute or chronic, and accompanies the various tubercular and other obstructions in that organ. Hence inflammation of the liver is not infrequently mistaken for inflammation of the lungs; and in some of the chronic diseases of the liver the cough is occasionally complained of as the most urgent symptom. The presence of pain in the right side, shooting up to the top of the shoulder, the dryness of the cough, and pain, enlargement, hardness, or uneasiness on pressure below the ribs of that side, will afford the best means of distinguishing whether a disease of the liver is the origin of the cough. Disorders of the stomach are also often accompanied with a cough of the same dry and teasing nature. A short cough is, therefore, a frequent symptom of indigestion. In short, there is scarcely any one of the viscera in the cavity of the abdomen the irritation of which, in a state of disease, has not excited cough. Disorders of the spleen, pancreas, and even the kidneys, have all given rise to this symptom; and external tumors attached to them have had the same effect. Any distension of the abdomen, which, by its pressure upward, impedes the descent of the diaphragm, and consequently the expansion of the lungs, occasions cough. The variety of causes from which coughs may arise must convince every reader of the absurdity of attempting to cure all kinds of cough by the same remedy. The treatment can be satisfactorily indicated only when the real cause is ascertained. When a long uvula is the cause a small piece may be snipped off; when it is a relaxed condition of throat, or a similar state of the box of the windpipe, local applications, paints directly applied by a brush, or inhalations, are the suitable remedies. One of the commonest coughs attends slight swelling and irritability about the larynx. To relieve this warm poultices should be applied to the front of the neck, or a piece of flannel sprinkled with turpentine should be placed over the larynx on the neck. In bronchitis and inflammation of the lungs the treatment of the cough resolves itself into the treatment of the special disease, and so with the cough due to diseases of distant organs. Often soothing remedies must be given to allay the excitability of the irritated nerves.

Couiy. See TREE-PORCUPINE.

Coulanges, koo-lañzh, **Numa Denis** (dŭ nē) **Fustel de,** French historical writer: b. Paris 18 March 1830; d. Passy, near Paris, 12 Sept. 1889. After filling professors' chairs successively at Amiens, Paris, and Strasburg, he was transferred in 1875 to the École Normale at Paris, and became a member of the Institute in the same year. His earlier writings, 'Memoir on the Island of Chios' (1857), and 'Polybius, or Greece Conquered by the Romans' (1858), had hardly prepared the reading public for the altogether exceptional importance of his brilliant book, 'The Ancient City' (1864; 10th ed. 1885), which threw a flood of fresh light on the social and religious institutions of antiquity. The work was crowned by the French Academy, as was also his profoundly luminous 'History of the Political Institutions of Ancient France' (1875); while 'La Gaule romaine' (1888–91) received the Reynaud prize.

Coulomb, Charles Augustin de, ȯ-güst-an dė koo-lōn, French scientist and inventor: b. Angoulême, France, 14 June 1736; d. Paris 23 Aug. 1806. He is famous for his experiments on friction, and the invention of the torsion balance for measuring the force of magnetic and electrical attraction. In early life he entered the engineers' corps and served some time at Martinique. In 1777 he gained an Academy prize by a work on magnetic needles, and again two years later by his 'Theory of Simple Machines.' Coulomb was a member of the French Academy, and in 1784 was made intendant general of the waters and fountains of France.

Coulomb, the unit of quantity in measuring electric currents. It is the quantity produced by a current of one ampere in one second. See also AMPERE.

Coulter, kōl'tėr, **John Merle,** American botanist: b. Ningpo, China, 20 Nov. 1851. He graduated at Hanover College, Ind., 1870; was appointed botanist of the United States Geological Survey in the Rocky Mountains 1872–3; professor of the natural sciences, Hanover College 1874–9; and professor of biology in Wabash College 1879–91. He was president of the University of Indiana 1891–3; president of Lake Forest University 1893–6, when he was elected professor and head of the department of botany in the University of Chicago. Since 1887 he has also been special agent in botany for the United States Department of Agriculture. Among his many publications are: 'Manual of Rocky Mountain Botany' (1885); 'Botany of Western Texas; Manual of the Phanerogams and Pteridophytes' (1891–4); 'Preliminary Revision of the North American Species of Cactus, etc.' (1894); 'Preliminary Revision of the North American Species of Echino Cactus, Cereus, and

Opuntia' (1896); 'Morphology of Spermatophytes,' with Chamberlain (1901); 'Plant Relations' (1899); 'Plant Structures' (1899); 'Plant Relations' (1900), the last three being excellent introductory manuals for use in schools. He is editor of the 'Botanical Gazette.'

Coumarin, or **Cumarin**, a compound of the aromatic series, having the formula $C_9H_6O_2$, or $C_6H_4 < \begin{matrix} CH:CH \\ | \\ O-CO \end{matrix}$ and occurring in nature in the Tonka bean (the fruit of *Coumarouna odorata*, or *Dipteryx odorata*), in small white crystals, between the seed-coating and the kernel; also in woodruff (*Asperula odorata*), in the leaves and flowers of sweet-scented vernal grass (*Anthoxanthum odoratum*), and in other plants. It is obtained from the Tonka bean by extraction with strong alcohol, and it may also be prepared synthetically by heating sodium-salicyl-anhydrid with acetic anhydrid, or by heating phenol with malic and sulphuric acids. It crystallizes in colorless triclinic plates, which melt at 153° F. Coumarin is scarcely soluble in cold water, but dissolves somewhat in hot water, and freely in alcohol. It has an agreeable, aromatic odor, and a burning taste. Melted with solid caustic potash, it yields acetate and salicylate of potassium. The peculiar odor of Swiss schabzieger cheese is due to the coumarin existing in the melilot that is used in its manufacture. The "Maiwein" (or May-wine) of the Germans is prepared by steeping woodruff in white wine, and owes its pleasant aroma to the coumarin that that herb contains. Indeed, the woodruff is often dispensed with, and the Maiwein prepared by the direct addition of an alcoholic solution of pure coumarin.

Coumoundou'ros, or Kumundo'ros, Alexander, Greek statesman: b. Messenia 1814; d. Athens 27 Feb. 1883. He entered the Greek chamber of deputies in 1850, became president of that body, and was subsequently appointed a minister of State with charge of the department of finance. His first official step was to propose to the chamber a bill for the recognition of the Greek debts of 1814 and 1825 contracted in the struggle for freedom, and succeeded in securing its adoption 1879. He was frequently prime minister of Greece, and held the office longer than any contemporary Greek statesman. His popularity was very great through the country; he was called the Cavour of Greece.

Council (L. *concilium*), an assembly met for deliberation, or to give advice. The term as used in an ecclesiastical sense specially applies to certain assemblies of the Roman Catholic Church. These may be classified as ecumenical, provincial, or patriarchial councils, and synods; but the last is not usually included among councils. An ecumenical, or general council is one in which bishops and others entitled to vote are convoked from the whole world to deliberate on the state of the Church or to meet an emergency, as the rise of a new heresy. The decrees of such a council, having received papal confirmation, are binding. A council might be ecumenical in its convocation, yet if its decrees did not receive the papal confirmation they would not be binding, and the council would not be considered of ecumenical authority. Or a council might not be ecumenical in its convocation, but its decrees being accepted and receiving the papal confirmation, it is then classed as ecumenical. The First Council of Constantinople was originally a council of the East, but ultimately its decrees on faith were accepted in the West and received the confirmation of the Pope. Patriarchal councils represent a whole patriarchate; national councils, a nation; and primatial councils, provinces subject to a primate. (See PATRIARCH.) Provincial councils are of a province and are known usually by the name of the metropolitan see; as the Baltimore Council. (See METROPOLITAN.) Diocesan councils, usually termed synods, are composed of the clergy of the diocese and are presided over by the bishop or vicar-general or a representative of the bishop.

Ecumenical councils are convoked by the Pope, and are under his presidency or that of his legate. In the early ages of Christianity councils were sometimes convoked by emperors, but only by permission or by request of the Pope. The dangers and difficulties of traveling in those times made it necessary to have the protection of the civil powers, and hence the real part which the emperor took in convoking the council was to promise it immunity from those who might wish to influence or retard its deliberations. The patriarch, metropolitan, or bishop, convokes the council within his jurisdiction. The membership of councils not ecumenical consists of the local clergy, as in a diocese, or the suffragan bishops of a province or patriarchate. Certain rules regulating representation are observed. In the early ages (and even as late as 1598), laymen were sometimes invited to attend provincial councils. They were permitted to present complaints and give advice, but it is very doubtful if they ever took any part in the voting. In two instances at least women attended (see HILDA, ST., ABBESS). Ecumenical councils are composed of patriarchs, archbishops, and bishops, and such other ecclesiastics as may be invited for specified reasons, as theologians, one at least for each archbishop or bishop. (The council of Trent gave procurators — priests and deacons — of absent bishops a right to vote. The Vatican council did not even admit to the council hall such procurators.) Cardinals, even if not bishops or abbots, generals of regular orders, mitred abbots of whole orders, may be members with right to vote. The rule has always prevailed that no royal representative may be present at any council except a general one in which "faith, reformation, and peace" are in question.

The presidency of a council does not confer an *ex officio* right to vote or to take part in the deliberations, such right depending upon the hierarchical rank of the one presiding.

Usually bishops take their places according to the rank of their sees. At the Vatican council they were arranged according to their hierarchical rank,— first the Pope, then the cardinals, patriarchs, primates, archbishops, bishops, abbots, and generals of orders. The voting is generally by single vote, but at Constance the vote was by nations. At Basel the members were divided into four deputations which met separately. Decrees passed by three deputations were accepted by all. At Trent much of the matter to be debated was first considered by commissions. (See TRENT, COUNCIL OF.) The proceedings of the Vatican council, not yet

finished, were conducted in a somewhat similar manner.

Church historians usually regard the assembly of the apostles in Jerusalem described in the Acts of the Apostles as the first example of a general council of the Church; yet that assembly is not entered in the list of the 20 general councils. From the times immediately subsequent to the epoch of the apostles, the fathers always on occasion of controversy over questions of faith or of discipline appealed to the tradition of the apostolic doctrine and government as preserved in the churches founded by the several apostles or authentically derived thence, to the churches scattered over the world. Not till peace was assured to the Christian body by Constantine, was it deemed prudent to hold a general assembly of the Church's pastors, the bishops; though in various provinces of the empire — in Gaul and Spain, in Mesopotamia, in Africa, synods or councils were held even in the times of persecution. But in the year 325 there assembled at Nicæa in Bithynia, at the call of the emperor, the first or Nicene council. As this council and many which followed were in their membership predominantly eastern, so in later councils western bishops predominated; and for some time the decrees of these predominantly eastern, or predominantly western councils were not accepted by both sections; but in time many of them received a tacit acceptance as expressing the teaching of the whole Church Catholic; while the decrees of other eastern and other western churches are ignored on one side or the other.

The general or ecumenical councils of the Church, as reckoned by Roman Catholic historians, are as follows:

		A.D.
1.	Council of Nice (*Nicæa*)	325
2.	First Council of Constantinople	381
3.	Council of Ephesus	431
4.	Council of Chalcedon	451
5.	Second Council of Constantinople	553
6.	Third Council of Constantinople	680
7	Second Council of Nice	787
8.	Fourth Council of Constantinople	869
9.	First Council of Lateran	1123
10.	Second Council of Lateran	1139
11.	Third Council of Lateran	1179
12.	Fourth Council of Lateran	1215
13.	First Council of Lyons	1245
14.	Second Council of Lyons	1274
15.	Council of Vienne	1311
16.	Council of Constance	1414–1418
17.	Council of Basel	1431–1438
	Council of Basel continued in Council of Ferrara-Florence	1438–1442
18.	Fifth Council of Lateran	1512–1517
19.	Council of Trent	1545–1563
20.	Council of the Vatican (not finished)	1869

Of these councils the Greek Church acknowledges the first seven. See separate accounts of the different ecumenical councils.

Among religious bodies of the Protestant faith the word council is applied to assemblies lacking the authoritative form of the Roman Catholic councils. In the Baptist and Congregational denominations it is customary to use the term council in relation to gatherings called on matters of local or restricted interest or in connection with ordinations or other church functions. A national council in these denominations is advisory in its nature. The Pan-Presbyterian Alliance is in the nature of a council of churches following the Presbyterian form of organization and holding the Reformed faith. The Evangelical Alliance (q.v.) is broad and inclusive in its constituent elements and in the themes considered. In the systematic nature of their organizations and the authoritative character of their decisions the councils of the Roman Catholic Church are more nearly related to the permanent governing bodies of evangelical sects charged with the regulation of faith, order, and discipline — such as the general and diocesan conventions of the Protestant Episcopal Church, the general assemblies and synods of the Presbyterian Church, the general conferences of the Methodist Church, etc.

In its use as a term relating to civil government, the word council signifies a body of men selected to advise a sovereign or other ruler. The body exercising such functions in Great Britain is known as the privy council (q.v.). In colonial times there existed in America councils modeled on the English privy council and originally intended as the executive bodies of the various provinces, in conferences with the respective governors. Such a body was called the executive council or legislative council, or simply the council, and besides its executive functions, bore much the same relation to the popular assembly that the Senate does to the House in the States. As the legislatures developed into the form in which we now know them, the upper house kept the name council till long after the Revolution; in South Carolina till 1790; in Delaware till 1792; in Georgia till 1798; and in Vermont till 1836. The Territories have retained the name, and it is used in some States for a body like that in the old provinces, the executive council of the governor.

Council of the Ancients (*conseil des anciens*), an assembly instituted by the French Directory in 1795, which shared the power with the executive directory, and composed, with the Council of Five Hundred, the legislative body. It had 250 members, either married or widowers, residents of France for at least 15 years, and a third of the number were to be renewed annually. This council held sessions in the Tuileries, in the hall of the convention, and had the power to change the residence of the legislative body. It confirmed or rejected, but could not amend, the measures proposed by the Council of Five Hundred. It was overthrown on 19 Nov. 1799 (19th Brumaire). See DIRECTORY.

Council of Blood, The, a court created in the Netherlands by the Duke of Alva, its object being to put down all agitation caused by the religious and political tyranny of Philip II. Its first session was held 20 Sept. 1567, and in less than three months it had put to death 1,800 persons, among them the counts of Egmont and of Hoorn. See ALVA.

Council Bluffs, Ia., a city and county-seat of Pottawattamie County, situated on the left bank of the Missouri, opposite Omaha, Neb., at the junction of several railroads, chief of which are the Union Pacific, Chicago & N. W.; Chicago, M. & St. P.; Chicago, B. & Q.; Chicago, R. I. & P., and the Ill. Cent. The name is said to have been derived from a council held here in 1804 between the Indians and the explorers Lewis and Clark. In April 1847 the Mormons, who had been violently expelled from this place, became the pioneers of the new Mormon settlement of Utah. Council Bluffs has manufactories of iron, paper, agricultural implements, etc. Pop. (1900) 25,802.

Council of Five Hundred (*conseil des cinqcents*) was established by the French Directory 23 Sept 1795. It was composed of 500 members, each of whom had to be a resident of France for at least 10 years previous to appointment, and not under 30 years of age. One third of the 500 had to be renewed annually. It held its sessions in the Salle du Manége, in the Rue de Rivoli. This council had power to frame laws which, after being read three times at intervals of 10 days, were proposed to the Council of the Ancients, who accepted or rejected them. On 4 Sept. 1497 (18th Fructidor, year V.) the majority of the Directory, suspecting that certain members of this council were really royalists, expelled about 50 of them and restricted their powers. When the Jacobins again secured the ascendancy the council regained its influence; but it was violently dissolved by Napoleon on 19 Nov. 1799 (19th Brumaire, year VIII.). See DIRECTORY.

Council Grove, Kan., a city and county-seat of Maris County, situated on the Neosho River, and on the Missouri, Kansas & Texas and the Missouri Pacific railroads, about 50 miles from Topeka. It is the centre of rich grazing country, and its principal business is connected with stock raising. The city owns its own water and lighting plant. Pop. (1905) 2,510.

Council of the Indies, The, a tribunal to which, in conjunction with the *Casa de Contratación,* or India House, at Seville, the administration of the Spanish colonies was assigned by King Ferdinand. It was the business of these two tribunals to further the progress of discovery, watch over the infant settlements, and adjust the disputes which grew up in them. Eventually the India House was subordinated to the council, the powers of the latter having been greatly extended in the reign of Charles V.

Council of State (*Conseil d'etat*), an advisory body which existed in France from early times, but which was developed and its duties well defined under Philip IV. and his sons. It consisted of magistrates and statesmen selected by the sovereign, to give advice on affairs of state. Its powers were often modified, especially in 1497, and again about 1630 when, under Richelieu, it occupied a most important place in the government. Napoleon reorganized the council, and extended its duties. Under him and the second empire it consisted, besides members of the imperial family, of the chief functionaries of state in the different departments of public service, war, marine, public works, etc., and was intrusted with the elaboration of projects of law to be submitted to legislative chambers, and with the defense of these projects before the chambers. This council is now composed of 90 members, part of whom are nominated by the president and part by the legislative assembly. Its duties are to advise on administrative and legislative affairs.

Council of Ten, a secret tribunal in the old republic of Venice, instituted in 1310, after the conspiracy of Tiepolo. It was first composed of 10 members who wore black costumes; later six more, who wore red, were added. This council was founded to protect the interests of the state, and it had power to punish its enemies. All its processes were secret, and through its means some of the most wicked and bloodiest crimes were committed. At first established temporarily, it was prolonged from year to year until 1335 it was declared perpetual. It went down with the republic in 1797.

Council of War, an assembly of officers of high rank called to consult with the commander-in-chief of an army or admiral of a fleet on matters of supreme importance.

Councilman, William Thomas, American physician: b. Pikesville, Md., 2 Jan. 1854. He was educated at the University of Maryland, was for some time assistant professor in Johns Hopkins University and is now (1903) Shattuck professor of pathological anatomy at Harvard University. He has given much attention to the study of smallpox and has recently announced his important discovery of the probable etiology of smallpox. He has published: 'A Contribution to the Study of Inflammation' (1879); 'Ueber fibrose Tuberkel' (1881); 'Zur Aetiologie der Eiterung' (1883); 'On the Etiology of Malaria' (1884); 'Syphilis of the Lungs' (1890); etc.

Counsel, in the United States a term applied indiscriminately to all members of the legal profession retained in a cause; as, the counsel for the defendant. In the United Kingdom the word has a limited and specific use, "lawyers," as the term is understood in America, being classified as advocates, attorneys, barristers, counselors, proctors, serjeants, solicitors, etc. The function of the counselor, or more usually, barrister, is the pleading of cases in court from the data furnished to him by the attorney or solicitor in the form termed a brief (q.v.). King's counsel (abbreviated K. C.) are barristers appointed counsel to the crown by the lord chancellor. They have the privilege of wearing silk gowns instead of the stuff gowns worn by ordinary barristers, of whom the king's counsel takes precedence, pleading cases from within the bar, while the utter or outer barristers plead beyond the bar.

Counselor, a term of loose meaning as used in the United States. Primarily it imports a person retained by a client to plead his cause in a court of judicature. It has no specific meaning, however, in general use, and in some parts of the country is used as is the word "lawyer." See COUNSEL.

Count, Countee, or **County** (Lat. *comes*) appears to have been first used, as a title of dignity, under the reign of Constantine. During the existence of the republic the inferior officers, as *tribuni, præfecti, scribæ, medici, haruspices, accensi, præcones,* who accompanied the *proconsules* and *proprætores* into their provincial governments, were known as the *comites* or *cohors* of their provincial. On the establishment of the imperial government the name was applied to the court and household of the prince; and Dio (53) mentions a council of senators selected by Augustus as his *comites.* On the first distribution of his dominions, and the foundation of the new capital by Constantine, 10 out of 35 provincial generals received the title of *comes.* After the fall of the Roman power the title was retained by the conquerors; and under Charlemagne it denoted equally a military or civil employment. About the end of the 15th century, in Germany, and under the last princes of the Merovingian race in France, the title appears to have become hereditary in families. Selden, in his 'Titles of Honor,' treats the

origin and progress of the title at much length, and with his usual learning. The institutions of the ancient German tribes may have contributed much to the establishment of this class of nobles. In early times, before the existence of the Latin *comites*, the Germans had officers chosen, at least in some tribes, by the people. These were a kind of inferior judges. After the Franks became the ruling nation they made a change in their character. The king now appointed them, and they exercised jurisdiction over certain districts in the king's name, with the title of *grafen*. These ancient officers are perhaps as fairly entitled as the *comites* to be considered the root of the subsequent counts. The German title *graf* corresponds to the title "count" in other countries of Europe. These *grafen* superintended the administration of justice, the police, and the taxes. After the time of the Carlovingian dynasty different classes of counts or *grafen* were formed; thus *pfalzgrafen*, or *comites Palatii*, the judges of the court who decided whether a case should be brought before the king; *markgrafen*, counts of the frontiers; *holzgrafen*, counts of the forests, that is, inspectors, etc. These royal officers soon usurped power which did not belong to them, and treated the people so badly that the emperors and kings were obliged to go themselves into the provinces and hold courts, or to send particular officers for this purpose, called *sendgrafen*. The sheriffs in England were originally the deputies of the English counts or earls, who correspond to the German *grafen*. Their Latin title is still *vicecomes*. Their English title, derived from "shire" and "gerefa," has the same origin with the German *graf*. (See SHERIFF.) In the 12th century the division of counties on the continent of Europe was abolished, and thus the counts lost their jurisdiction, except on their own possessions. In point of rank, the English earls are considered as corresponding to the continental counts. See COUNTY; EARL.

Count of Monte Cristo, The, a famous work by Alexandre Dumas, published 1844–5. It is the only novel of modern times which the great romancer has written; and it is so widely known that "the treasure of Monte Cristo" has passed into a proverb. The story opens in Marseilles, in the year 1815, just before the "Hundred Days." The first half of the book is a story of romantic and exciting adventure; the second is in a different key, sombre and unlovely, and not likely to convince any one that revenge is sweet. But the splendid imagination of Dumas transfigures the whole, its intensity persuades the reader that the impossible is the actual, and its rush and impetuosity sweep him breathless to the end.

Count of Presidential Votes. See ELECTORS, UNITED STATES PRESIDENTIAL.

Count Robert of Paris, a novel by Sir Walter Scott, published in 1831. The scene is laid in Constantinople during the reign of Alexius Comnenus (1080–1118). Many historical facts are altered for artistic effect. At the time of the story Anna Comnena was only 14 instead of over 30, and was not the heiress to the throne. The most striking scene is the swearing allegiance by the Crusaders to the emperor as overlord, in which Count Robert defiantly seats himself on the throne with his dog at his feet.

Counter-irritation, the production of an artificial inflammation in order to relieve another in some other part of the body. The principal counter-irritants are dealt with in the article on blister (q.v.).

Counter Reformation, a movement that took place in the Roman Catholic Church in the 16th century, chiefly as the result of the Protestant Reformation. The movement was in one aspect a more or less definite and avowed attempt to counteract the Protestant revolt, and in another, an inevitable outcome of the very conditions that produced the great schism. Among those who shared the widespread discontent with existing abuses in the Church and who longed for a return to its apostolic purity and simplicity, there were many who remained loyal to the Roman communion and believed in the possibility of an internal reform. There were others whose piety and sincerity of motive were more questionable, but who from wise policy advocated an amendment of life and doctrine, perceiving that force alone was not sufficient to keep wavering adherents within the Church's pale nor to regain those who had broken away. The Council of Trent was one of the most prominent of the factors in the problem of checking the spread of the Reformed faith. Conciliatory measures which were originally intended were abandoned after the fifth session and attention was concentrated on the reaffirmation of doctrines questioned by the Reformers, and on regulations for the purification of the Church. Even if Macaulay's estimate of the Jesuits' share in the Counter-Reformation be exaggerated, the devotion and zeal of Loyola and his followers undoubtedly played a large part in the abatement of ecclesiastical scandals and abuses. The Jesuits perceived that in an age of intellectual ferment and inquiry the Church must control the education of the influential classes if she would retain her domination over them, and in the perfectly organized Society of Jesus they offered her an instrument fitted for the task. The repressive and punitive features of the Counter-Reformation as illustrated by the work of the inquisition (especially in Spain and in the Netherlands), and by force of arms, banishment, confiscation, and other political penalties, are familiar, being more frequently dwelt upon than the changes taking place within the Church.

Counterfeiting, the making of imitations or counterfeits of money, either paper or coin,—in an extended sense including some degrees of forgery. This is a crime heavily punishable by statute, and the United States government has legislated at considerable length for its suppression. The punishment prescribed for imitating United States paper money is a fine of not over $5,000 and imprisonment at hard labor not exceeding 15 years; for counterfeiting coin, the penalty is a fine not over $5,000 and imprisonment at hard labor not exceeding 10 years; for minor coins of five cents and less, $1,000 fine and five years' imprisonment is the maximum. For having counterfeit money or counterfeiting tools in possession, or for counterfeiting post-office locks, or for altering or reusing revenue stamps, similar penalties are prescribed by statute. The United States laws on the subject may be found in the Revised Statutes, § 5413 et seq.

For the suppression of counterfeiting and enforcement of the laws on the subject, the United States has been divided into 10 secret-service districts, in each of which officials are constantly working to detect passers of counterfeit money and ferret out those who are engaged in its manufacture.

The paper money of the United States has been rendered very difficult of imitation by reason of the high character of the workmanship employed. The paper used includes colored silk threads, and as the manufacture of such paper for other purposes is prohibited, the counterfeiter must either control a paper mill, involving a very heavy investment, or must steal some government paper, or imitate the colored threads with colored lines written or printed. Pen-written lines are the usual form of imitation of these, commercial paper being employed, the nearest to the government paper that the counterfeiter can buy. The engraving of the plates is of such high quality that there are usually not a dozen men in the country, outside of those engaged on the government notes, who are capable of executing good imitations, and these men are known to the secret-service, which keeps an eye on them and their associates. The printing is done in colored inks in order to prevent reproduction of the plates by photography, which would be comparatively easy if printed in black. These conditions, combined with excellent work by the secret-service, have almost stopped the counterfeiting of United States paper money, and the temptation to counterfeit is still further reduced by the government's policy of changing the designs of the notes frequently, and withdrawing the old paper from circulation, rendering it certain that a high-class counterfeit would be driven out of circulation in a short time.

The success of counterfeiters is not so much due to the cleverness of their work as it is due to the ignorance and carelessness of the general public. A man who is not familiar with the distinctive ear-marks on the genuine money of the land cannot be expected to detect the counterfeit presentment of them when they face him on spurious money; so that every man ought to make himself familiar with these distinctive ear-marks of real money — and he must do so if he would successfully protect himself against the skilful imitations and the cunning devices of the shrewd counterfeiters who infest the land and prey upon this species of popular ignorance.

Steel-engraving is a fine art about which the general public knows next to nothing; and yet the possibility of detecting counterfeit paper money unerringly is bound up in the engraved features of its make-up. Of course, it is not contended that everyone must become a master of the engraver's art before he can successfully detect counterfeit money; but it is contended that he must make himself so familiar with the distinctive features of the genuine machine-engraving on the national currency that he can distinguish it from spurious and imperfect imitations of it. Nor is it a very difficult task. It can be done by anyone who will take the trouble incident to a proper study of the subject. The work executed by the government as well as that which is executed by banknote companies, possesses great beauty in its art and exact perfection in its execution and finish. It is mathematically and geometrically exact in all its parts, while the spurious work of imitating counterfeiters is necessarily imperfect in these respects.

This is due to the fact that the former is done by machinery, while the latter is done by hand; and to the further fact that hand-engraving, even when aided by simple machinery, can never approach the beauty, exactness and general perfection of machine-engraving. And yet although these very designs have bound up in them the chief safeguards which the government has thrown around our national currency to protect it against being successfully counterfeited, not one man in any 10 met upon the streets of our cities, much less among the rustic tillers of the soil, is familiar with either the character or the object of those beautiful designs which are found upon our national currency. This fact is very aptly illustrated by the tests which are applied by different persons to determine whether a suspected note is spurious or genuine: one looks carefully for pen-holes; another scans it for signs of wear, and another scrutinizes the vignettes, while others examine the paper,— not knowing that all of these evidences may be counterfeited successfully or imitated so perfectly as to deceive almost anyone; but very few, if any, apply those real tests which involve the only truly and unmistakably distinctive features of genuine notes. Hence, the alarming success of counterfeiters in passing their spurious products is not so much due to the fact that the excellence of their imitations of these distinctive features of genuine notes is prone to deceive the intelligent observer as it is due to the fact that the general public is ignorant concerning the construction, purpose, character, and distinctive features of that difference which distinguishes the genuine from the spurious. Everything on the average national currency note, except the fine lines of engraving, may be successfully counterfeited; but these fine lines defy all impostors. All of the circles, ovals, squares, and parallels, as well as the geometrical lathe-work upon which the denominations are usually placed, are composed entirely of a perfect network of finely engraved lines which cross each other at such angles or approach each other at such distances as to produce the desired effect. These finely engraved lines constitute the chief, the distinguishing feature of the government's money-engraving, and they cannot be successfully counterfeited.

It will be noticed in all genuine work that these fine lines can be traced by use of a lens, throughout the figures,— not a line being broken, not a line losing itself in another line and not a line showing any irregularity whatever in its course, in its uniformity of curve and width, or in its degree of shading. These lines may be either white upon a background of black, green or red; or they may be black, green or red upon a background of white; but they are always exact, always even and always uniform. They are made by a geometrical lathe which was invented by one Asa Spencer and introduced to the public about 1818.

This lathe is a perfect wonder; it produces patterns of almost every conceivable variety in form and figure; but this same fine quality of the lines clings to them in whatever form they may appear. So that, when it is remembered that this uniformity and uniqueness of execution

is impossible in hand-engraving, the spurious note falls all to pieces under this test. The striking difference between the genuine and the spurious is very natural from the simple fact that the one is mathematical and exact, while the other is mechanical and necessarily varied. The lathe does not engrave directly upon the note plate, while the counterfeit engraver does. The lathe engraves upon a piece of soft steel one eighth of an inch thick. After this piece of soft steel has been properly engraved by the lathe, the piece of engraved steel is hardened by a peculiar process; then (by means of a powerful machine called a transfer press) a cylinder of soft steel is rolled over the hardened piece of engraved steel in such a manner that the engraving is transferred to the cylinder, which is then hardened; and, from this hardened cylinder the designs are transferred to the note-plate by means of the transfer press. In this way the work is not only exact — mathematically exact and artistically perfect — but it is always uniform; for this cylinder acts as a perpetual model from which any number of plates can be transferred — each being an exact facsimile of all the others taken from that same cylinder. Hence all United States notes of any one series are exactly alike in every respect — except the numbers and the signatures. And right there is where the counterfeiter falls down before the practised eye. He must do his engraving directly upon the note-plate — which imposes many insuperable difficulties; the lines cannot be made as perfect as they are in this lathe work, and the general effect of the printing is inartistic in comparison with the impressions taken from lathe-made plates. Even to the naked eye the appearance is more or less dull and sunken, or scratchy; and the figures are sure to be lighter or darker in spots, as the lines are heavier or lighter in places. The use of the lens in such cases discloses the fact that the lines are often broken, varied or irregular, either in size or course. Besides, it being impossible for any hand-engraver to produce two dies exactly alike, it happens that the spurious dies are not only not exact reproductions of the genuine lathe-made dies, but no two of the spurious dies are exactly alike; so that comparison, under the lens, between the dies on a suspected note (if it be spurious) and a genuine note brings out this difference so clearly that very little skill is required to detect and read it.

All the government dies used in printing any given series are exactly the same — all being transferred from the same cylinder, and they must therefore be exactly the same in every respect. This impossibility of making two dies separately and independently exactly alike by the hand-engraving process not only prevents the counterfeit dies from being like the genuine, but it also prevents any two counterfeit dies from being exactly alike, since the plates must be separately and independently engraved. But besides this absence of exactness in the reproduction of the dies, there is another notable feature of difference which is conspicuous for its presence in the genuine and for its absence from the spurious note; and that is the beautiful, clear-cut, raised impressions produced by the correct and uniform lines of the lathe-work which the counterfeiter cannot reproduce to save his life.

This machine work is therefore the safest ear-mark there is for detection purposes; but it must be used intelligently. In examining this work on any suspected note, it is a pretty safe way for the examiner to begin at the centre of the curvilinear figures and then gradually follow the lines around the circles, one within another, carefully searching for any special defects and for the discovery of any irregularity not patent to the naked eye. And he should also make careful and minute comparisons between the general designs on the genuine note and those on the suspected one.

Sometimes the whole face of a note (except the vignettes and dies) are tinted a pale red or some other color; but examination under a lens discloses the fact that this tint is composed of fine crossed or looped lines running clear across the face of the note. This is another species of machine work which is but poorly imitated by the most expert counterfeit engraver who has to depend upon his hands. This work, when genuine, shows the lines to be perfect in execution and in shading, while the spurious note bears evidence of imperfection in both respects.

Parallel lines also afford a check. They are made by a parallel-ruling machine, which is governed by an index to regulate the width of the lines, and they are mathematically exact. They are always uniform, always regular, and always exactly parallel — conditions which do not obtain when the counterfeiter undertakes to reproduce them by the process of hand-engraving. These parallel lines are used in shading the letters and figures on the genuine notes into a perfectly even pale gray. They are also used to represent a clear sky or water; but crossed lines are used to represent cloudy or heavy skies. In genuine work these lines can always be counted, while such is not always the case with counterfeit notes, as the lines on them are often broken, blurred, and irregular.

Some people rely on the vignettes as reliable ear-marks for detection purposes; but they make a mistake in doing so. The vignettes are the most artistic part of the whole note, and they are mostly hand-engraved, even on the genuine notes; so they may be almost perfectly imitated or reproduced — but that is not often the case. The vignettes on the national currency are made by the very finest artists in the country, and they are beyond the successful imitation or reproduction of any one but an artist of the first water; and, since the salaries which such artists can command at legitimate work are too satisfactory for them to resort to the rather risky business of counterfeiting themselves or lending their talents to others engaged in that hazardous outlawry, these would-be imitations are made by rather inferior artists and are necessarily imperfect in many respects. Real vignettes have this advantage over spurious ones: They are never made but once, and are therefore uniform and always exactly the same. They are transferred to the cylinder, just as the lathe-work is, and then transferred (by use of the transfer press) from the cylinder to the note-plate, thus using one model all the time; but such is not possible with the spurious vignettes. They must be reproduced, and exact reproduction is very difficult, if not impossible. But, it being noticed that counterfeiters get along better in reproducing outdoor scenes than

they do in reproducing portraits, the government has very wisely mingled its vignette work — making them consist of outdoor scenes, historical pictures, portraits, and allegorical figures, which it not only becomes difficult for counterfeiters to imitate, but which furnishes a somewhat graduated scale of difficulties for them to surmount.

The engraving test is the best possible earmark in the detection of counterfeits, for two very good and sufficient reasons: In the first place, the above-noted differences will always appear as long as counterfeiters have to rely upon hand-engraving while the government uses machine engraving; and, in the second place these counterfeiters will always have to rely upon hand-engraving, because machines for the purpose are too bulky and too expensive for them to handle,— considerations which will always place machine-engraving beyond their reach. If a man has $75,000 to $150,000 capital (the cost of a proper outfit of machinery for this work), he would hardly risk its investment in an illegitimate enterprise which might be swooped down upon at any moment by government officers and utterly destroyed, with the legacy of a long sentence in the penitentiary added. Hence, it may be pretty safely assumed that all the engraving done upon spurious note-plates will always be done by hand, and that this test can always be applied.

Coin is more easily counterfeited. The government mints it by subjecting blanks of metal to heavy pressure between dies. The cheap imitator casts them under slight pressure in a base metal. The maker of a better grade of counterfeit coin cuts out or casts a blank or disk of the required size, and compresses it between dies in an ordinary stamping-press. To make a really good imitation of gold coin requires a very wide knowledge of alloys, possessed by very few men, and principally for this reason counterfeit gold coins are scarce. The imitation of silver is much easier, as there are in the market numerous metals, used in the manufacture of tableware, etc., that closely simulate silver. Their principal basis is lead, and it is by the softness of the mixture and its increased weight that counterfeit silver is most easily detected. It does not require an expert to distinguish the average counterfeit silver coin from the genuine, as a simple balancing on a scales with a good coin shows the difference in weight, a shave with a penknife exhibits the softness of the metal, and ringing the coin produces a dull sound as compared with the ring of silver.

Counterfeits made in real silver have been circulated since the value of the metal deteriorated, and these, if well made, are very difficult of detection. The government's principal safeguard against them is obtained by watching all purchasers of silver, and following up those who do not seem to have good reason for requiring it. The imitations of five-cent pieces in the real metal are not difficult for a skilled mechanic, and the statement has been widely circulated that they were once actually manufactured by convicts while serving sentence in a prison of one of the larger States, where nickel-plating was carried on in the workshop. The more common imitation of the five-cent piece, however, is simple lead, cast in a mold, and, while easy of detection, it secures circulation because the passers handle it without examination. This is the most usual form of counterfeiting carried on to-day, and a flood of bad nickels is liable to break out anywhere as the result of some misguided man's efforts. As soon as they attract attention in a locality the secret-service men concentrate their action, and usually find the base of supplies within a few months, unless the counterfeiters take the alarm and fly, destroying their apparatus.

The most elusive counterfeiter the United States secret-service men were ever called on to unearth was a New Jersey mechanic skilled in photography and the use of the pen and brush. For many years he patiently imitated twenty-dollar greenbacks by hand, making about one a week, and then going to some New York saloon to change it. His work was very artistic, and he could surely have made more money by legitimately employing his talent in the trades. He was finally caught passing a note, and sentenced, the almost invariable fate of every persistent counterfeiter.

Countermark, in numismatics, the name given to those stamps or impressions which are found on ancient coins or medals, and have been given since their first impress. These countermarks or stamps are often executed without any care, and frequently obliterate the most interesting portion of the original inscription. There have been various opinions respecting the cause of these countermarks; some antiquaries thinking that they were to indicate an augmentation of the value of the money upon which they were stamped; others, that they were vouchers for workmen; and, again, that they were only struck upon money taken or received from foreign enemies. During the long war with revolutionary France Britain stamped millions of Spanish dollars with small, oval countermarks of the head of George III. upon the neck of the Spanish monarch. Many of them were completely restamped or countermarked in the mint, but the new impression sometimes failed to entirely obliterate the old.

Counterpoint, in music. This word is used in two different significations by musical authorities; by some it is employed simply as an equivalent of harmony, by others it is used to denote the art of composition generally. In former times musical sounds were represented by dots or points placed on the lines, and the added part or parts were written by placing the proper points under or against each other (*punctum contra punctum*). It is preferable to apply this term now to that branch of the art which, a musical thought being given, teaches the development of it, according to the laws of the art, by extension or embellishment, by transposition, repetition, or imitation throughout the different parts. It thus stands related to harmony as literary composition stands to grammar. Simple counterpoint is the art of adding a part or parts to a given melody in notes all of equal time value, as in plain-song or ecclesiastical style. Florid counterpoint is when the notes of the added parts are of less time value (say two crochets or four quavers against a minim) than those in the melody or subject, as it is called. In double counterpoint, the subject may start in the bass and be repeated in the upper part, or *vice versa*. It becomes triple or quadruple when two or three parts are added

with the harmony inverted. Further, counterpoint is divided into the free and strict styles, the former, which is of the florid order, allowing many licenses as to discords, etc., not permitted in the dignified slow movement of the strict style. It has been said that the art was known as far back as the 4th or 5th century; others again ascribe its invention to Guido d'Arezzo in the 11th century, or Adam de la Hale two centuries later. It was not until the 17th or 18th century that the art attained its maturity under the fostering care of J. Sebastian and Emmanuel Bach, Handel, Haydn, Mozart, and Beethoven. The best authorities on this subject are the treatises of Albrechtsberger, Cherubini, and Fétis.

Coun'tersign, in military affairs, a watchword used to prevent unauthorized persons passing a line of sentries, whose orders are to stop any one unable to give it. It is fixed each day by the commanding officer, but may be changed at any moment if necessary, and is communicated only to those entitled to know it.

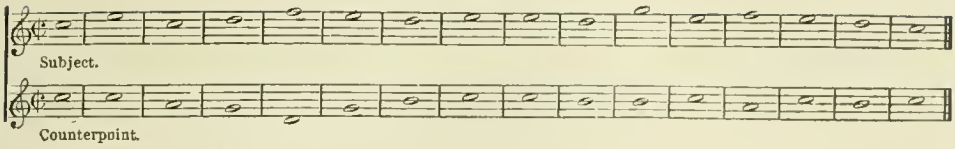
Counting-out Games. See GAMES.

Country- or **Contra-dance,** a dance in which as many couples can take part as there is space to accommodate them; the gentlemen being ranged at the commencement on one side, and the ladies on the other. The dancers are constantly changing places, leading one another back and forward, up and down, parting and uniting again. 'Sir Roger de Coverley' is the best-known example.

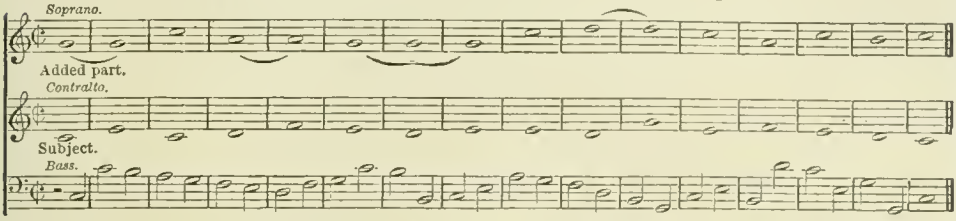
County, in the United States, an administrative subdivision of each State, intermediate between the body as a whole and the town, parish, or municipality. In the North (except the wild northern parts of Maine and New Hampshire), and the thickly settled States of the central West, it is an aggregation of actual towns, there being no county land which is not a part of some town. In the South and the more sparsely settled Western States, the town is a piece cut from the county, the greater part of which may be entirely unorganized, except as divided by the State into artificial sections for administrative convenience or the saving of future boundary disputes; townships (as also in Aroostook County, Me.), military districts as in Georgia, "wards" as in Louisiana, "beats" as in Mississippi, etc. The relations of the county to the political and social life of the community also vary widely in different sections, owing to historic development. In New England it is of less consequence than anywhere else in the United States: a mere artificial group of towns, which might be regrouped at any time with little disturbance. Here it has three commissioners, who act as its attorneys and representatives, as well as executive officers, apportion the taxes among the towns, care for highways, etc. The old militia regiment, of which the town train-bands were companies, has disappeared; the county court has been replaced by sessions of the State superior court on circuit; there are, as of old, a sheriff, court-house, and jail, a probate court, registry of deeds, etc. The representative system here is not based in the least on the counties, but on the towns in general, singly for the lower house in the State, and grouped into "senatorial districts for the upper. Hence there is but languid interest in county matters, and no feeling of county unity. But in the Middle and Southern States the county is a much more integral part of daily life; it is the basis of representation, and often the real unit of growth and settlement. In the Middle States the towns were the original centres of settlement, as in New England, but they have not reduced the counties to insignificance; on the contrary, the county-seat is usually the chief centre of business and political interest, and the coveted spot at which to edit a newspaper sure of the largest circulation — in New England the county-seat has no advantages as such to make it a newspaper focus, and frequently is an insignificant place where none is published — and the county meetings of the town boards of supervisors determine the important actions of the county population. In the South, generally, the county was originally not only the most important, but almost the one subordinate unit of settlement, owing to the paucity of towns due to the plantation system. The county regiment, instead of being made up of town companies, was divided into district bands for convenience of drill and assemblage; the local management was mainly by county instead of town officers; the magistracies were mostly self-perpetuating, in the hands of a few leading families, instead of being elective or even appointive. The very settlements intended for towns often did not grow into such, but spread into disconnected plantations, and became counties; as James City County and Charles City County, Va. In South Carolina there were two systems — the county in the low country, the district in the Piedmont region; after the war the district system was extended over the whole State; in 1868 it was abolished and the whole State divided into counties. But these are purely artificial creations, and not even created with good judgment; they are of immense size, nearly double those in Massachusetts or Connecticut, and treble those in Virginia or Kentucky; Charleston County is larger than Rhode Island. They have no courts, being grouped into judicial circuits. The real subdivision seems likely to take place within them. In Louisiana the corresponding divisions are called parishes instead of counties. The institution was brought from England by the first settlers: the county there was an old tribal settlement, sometimes a whole kingdom as in Kent, the counties or shires being gradually fused into the kingdom. The shires are therefore not divisions made in the kingdom, but small governments whose coalescence made the state. The name "county" was given them after the Norman Conquest, from their likeness to the counts' governments on the continent. At first here the English organization was copied: there were courts called quarter-sessions, justices of the peace with extensive powers, lieutenants, coroners or "crowners," etc. Virginia had the county in 1634, Maryland in 1638, Massachusetts in 1643. Consult: Fiske, 'Civil Government in the United States' (1890).

Coup, koo (Fr. "a stroke") a word used in certain phrases which have become almost universally current. *Coup d'état* (stroke of state) means an arbitrary encroachment suddenly effected by the governing authorities upon the constitution of a state, altering or setting aside the prerogatives of other parts of the body politic. The term is applied particularly to the

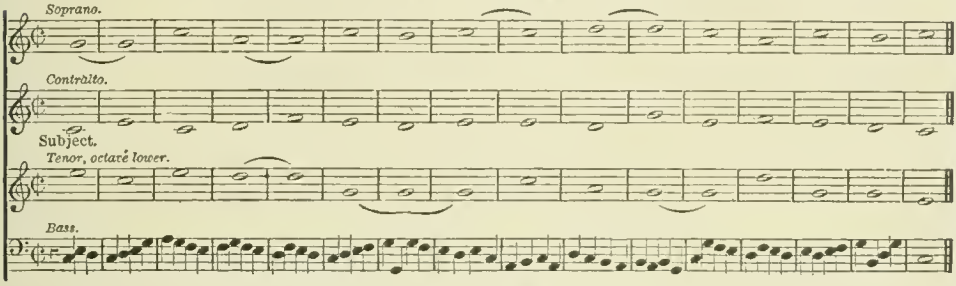
Example I.—Subject, with Simple Counterpoint.
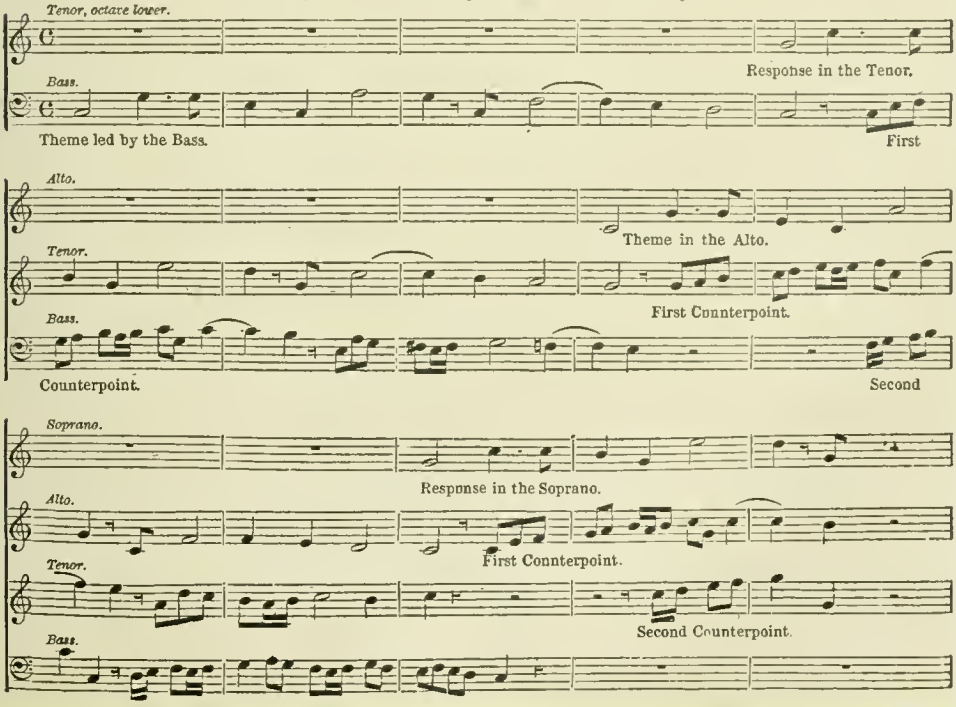


Example II.—Subject, with added Part, and Florid Counterpoint.



Example III.—Florid Counterpoint, in Four Parts.



Example IV.—From Haydn's Mass in C, Free Style.



procedure whereby Louis Napoleon placed himself as virtual dictator at the head of government in France, 2 Dec. 1851. *Coup de main* (a stroke of the hand) means a sudden and successful attack; *coup d'œil* (a stroke of the eye), a quick comprehensive view of a complicated matter; *coup de théâtre*, a trick of the stage, or any striking dramatic effect; and *coup de grâce*, the merciful blow that puts a victim out of pain; hence a decisive or finishing stroke.

Coupé, koo-pā', a four-wheeled carriage carrying two persons inside, with a seat for the driver outside.

Coupland, William Chatterton, English philosophical writer: b. London 2 Dec. 1838. He was educated at Manchester New College, and the University of Berlin, and held Unitarian pastorates at Bridgewater 1864–8; and at Kensington 1870–2. He was professor of mental and moral science at Bedford College for Women, London, 1881–6; first secretary of the English Goethe Society 1886–90; and has since lectured on philosophical themes. He has published 'Incentives to the Higher Life' (1866); translation of Hartmann's 'Philosophy of the Unconscious' (1884); 'The Spirit of Goethe's Faust' (1885); 'Elements of Moral Science Applied to Teaching' (1889); 'Gain of Life and Other Essays' (1890); 'Thoughts and Aspirations of the Ages' (edited) (1895).

Coupon, koo'pŏn (from Fr. *couper*, to cut), a warrant or certificate for the periodical payment of interest on bonds issued for any term of years. The interest being payable in different cases quarterly, half-yearly, or yearly, as many coupons are attached to each bond as represent the total number of such payments as are to be made, with the date of payment printed on each. When a payment of interest becomes due at any particular date the holder of the bond detaches the corresponding coupon and presents it for payment at the specified banking house or office. The term is also applied to one of a series of tickets which bind the issuer to make certain payments, perform some service, or give value for certain amounts at different periods, in consideration of money received.

Courbet, Gustave, güs-tăv koor-bā, French painter: b. Ornans, Franche-Comté, 10 June 1819; d. Vevay, Switzerland, 31 Dec. 1877. In 1839 he was sent to study law in Paris, but all the bent of his nature was turned toward art. He made himself acquainted with the Flemish, Florentine, and Venetian schools; but amid all he was careful to preserve — as he phrases it — his "own intelligent and independent individuality." In 1841 he took to landscape work, painting in the forest of Fontainebleau. In 1844 he began to exhibit at the Salon; and his works created a great sensation when shown in the Salon of 1850. His hunting scenes and animal subjects are especially vigorous and spirited. Several of his pictures are owned in the United States, four of them being contained in the Boston Art Museum. After the revolution of 1870 he was appointed director of the fine arts. In the following year he joined the Commune, and was responsible for the destruction of the Vendôme Column (16 May). For this act, in the following September, he was sentenced to six months' imprisonment, and to be fined for its restoration, his pictures being sold in 1877 toward that purpose. On his release he retired to Vevey.

Courbevoie, koor-bĕ-vwä, France, a town in the department of the Seine, on the left bank of the Seine, in the northwest suburbs of Paris. It contains numerous handsome villas; extensive barracks built by Louis XV. for the Swiss regiment, and manufactures of white-lead, carriages, etc. Pop. (1901) about 25,000.

Courcelle, koor-sĕl, **Daniel de Rémy**, rā-mī, governor of Canada 1665–72. The Mohawk Indians annoyed the colony by constant attacks, for which the governor sought to punish them by leading an expedition against their encampments. In the winter of 1666 he marched with 300 or 400 men from Quebec to the Mohawk valley by way of lakes Champlain and George, but gained nothing, as the extreme severity of the season decimated his force. The next year, with a much larger force, and under more favorable conditions, he had greater success, and succeeded in destroying several strongholds of the Indians. This invasion of English territory caused much alarm in the New York colony, and Gov. Nicolls protested vehemently. Courcelle was succeeded by Frontenac. Consult: Parkman, 'Old Régime in Canada,' p. 186 et seq.

Courier, koo'rĭ-ĕr, a bearer of special despatches, whether public or private. The employment of couriers is of great antiquity. There was a very complete organization of them in the ancient empire of Persia. They were also used by the Greeks and Romans. Couriers who act as guides to and attendants on travelers are common on the continent of Europe, and are useful to those having much baggage or unacquainted with the foreign languages and moneys. Their special duty is to make all arrangements for journeys, and to relieve their employers as far as possible of anxiety about passports, exchange of money, hotel negotiations, and the like. The speaking of several languages is therefore one of the many important qualifications of a good courier.

Courier de Méré, Paul Louis, pōl loo-ē koo-rē-ā dė mā-rā, French Hellenist: b. Paris 4 Jan. 1772; d. near Veretz, Touraine, 18 Aug. 1825. He was a pupil in the artillery School at Châlons and served in the army 1792–1809. In 1813 he made an elegant translation of 'Daphnis and Chloe,' an ancient romance by Longos, discovered by him at Florence; he also translated 'The Luciad, or the Ass of Lucius of Patras,' published with the Greek text (1818). His numerous pamphlets, especially his 'Pamphlet of Pamphlets' (1824), are masterpieces of style, of marvelous conciseness, and noteworthy documents for the history of the ancient political and ecclesiastical contentions.

Courland, koor'lănd, **Duke of.** See BIREN, ERNEST JOHN.

Courland, koor'land, or **Kurland**, Russia, a province on the Baltic, bounded north by Livonia and the Gulf of Riga, west by the Baltic, south by Kovno, and east by Vitebsk; area, 10,535 square miles. In the neighborhood of Mitau, the capital, the surface is diversified by hills of very moderate height; but elsewhere, and particularly toward the coast, it is flat, and contains extensive sandy tracts. About two fifths of the whole province is occupied by

forests; and there are many small lakes. The principal rivers are the Aa and the Windau; the latter is connected with the Niemen by a canal. Agriculture forms the chief occupation of the inhabitants, but many are engaged in fishing. The industrial establishments include distilleries, breweries, and factories for tobacco, metals, wool, and leather. A large number of the inhabitants are Letts, there being some Germans, Jews, Russians, and Poles. The prevailing religion is Lutheran. Courland was anciently a part of Livonia, and, like the latter, was conquered in the 13th century by the knights of the Teutonic order. It was subsequently united with Semgall, and, under the name of the Duchy of Courland, the two provinces became a fief of Poland. The duchy, however, was governed by its hereditary dukes till 1737. The sixth duke, Frederick William, espoused in 1710 Anna Ivanowna, princess of Russia, who, after his death, maintained possession of the duchy; but the government of it was intrusted to Prince Ferdinand, brother of the deceased duke. On the death of Ferdinand in 1737 the estates, in consequence of the influence of the empress of Russia, elected to succeed him her favorite and grand chamberlain, Ernest John Biren, who was exiled to Siberia in 1740. In 1762 the Emperor Peter of Russia recalled Biren, who after some contention with Prince Charles, son of the king of Poland, who had been placed over the duchy in his absence, was declared by the estates the only legitimate duke. In 1769 he transferred the duchy to his son, at whose death the estates of Courland solicited a union with the Russian empire. Catharine consented, and, by an edict of April 1795, secured to the inhabitants all the privileges which they had enjoyed under their princes, and all the rights of her other subjects. In 1818 the Emperor Alexander confirmed the charter of the nobility of Courland, which declared the peasants free, and regulated their relations to their former lords. Libau is the chief commercial city. Pop. 680,500.

Courser, kōr'sẽr, a bird of the genus *Cursorius,* belonging to the family *Cursoriidæ* of the order *Grallatores* (waders), closely allied to the plovers, characterized by a bill as long as the head, arched mandibles compressed toward the extremities, basal oval nostrils with an oblong lateral opening, and long legs with three separated front toes, the middle one longest and armed with a serrated claw. They are found chiefly in Africa and Asia, on arid inland tracts, along which they run with great swiftness. One of the species, called the black-bellied courier (*C. temminckii*), is eight inches long, and generally of a cream-colored brown, varied by a ferruginous head and breast, and black on the quills and middle of the body. One of the best-known species is the cream-colored courser, or swift-foot (*C. gallicus*), found almost exclusively in the East, although it has been seen as an occasional visitor in western Europe.

Coursing, a kind of sport in which hares are hunted by greyhounds, which follow the game by sight instead of by scent. Coursing is a very old sport, but in modern times it has been considerably modified in various ways, mainly through the influence of the English coursing clubs, which began to be formed in the latter half of the 18th century, one prominent club, the Swaffham, being founded in 1776. These clubs in 1858 formed a central body called the National Coursing Club, which now controls the whole sport. In 1882 the 'Greyhound Stud Book,' a genealogical record, was started, and dogs without pedigrees, or not entered in that book, are not now allowed to compete. Meetings are held in various localities, at which dogs are entered for a variety of stakes, as horses are at a race-meeting. The "blue ribbon" of the coursing year in England is the Waterloo Cup, run in the Altcar meadows, near Liverpool, for which 64 dogs compete.

This pastime has become immensely popular in the western United States, and under the supervision and control of the American Coursing Board, large meets annually take place in the open country of the two Dakotas, Kansas, Nebraska, Iowa, and Minnesota, where hares are plentiful. The contests take place in practically the same way as in England and under similar rules. The greyhounds are sent out, two in each leash, in the care of a "slipper," who lets the dogs slip upon orders from the judge, when a hare has been sighted. The judge follows the dogs, and gives "points" to each according to the cleverness of its individual work. It may so happen that the dog which actually kills the hare may not be adjudged victor, because the other dog may have made the most points during the course. The following is the scale of marks: (1) For speed, according to the degree of superiority shown, one, two, or three points. (2) For the "go by" (the starting of a greyhound a clear length behind its opponent, passing him in a straightaway run, and obtaining a clear length's lead) two or three points. (3) The "turn" (a sharp turn of not less than a right angle in the hare's course when pressed by a dog), one point. (4) "The wrench," a change of less than a right angle in a hare's course when pressed, half a point. (5) "The kill," two points or less. (6) "The trip," an unsuccessful effort which throws the hare off its legs; or the getting so close to the hare as to snatch the hare and lose hold, one point, more or less, in the judge's discretion. One course will often traverse three miles before a kill is made. The cavalcade of sightseers is kept in a line behind the coursing hare and hounds, by the steward. Consult: 'Coursing the Hare,' H. A. Macpherson ('Fur and Feather Series').

Court, Antoine, äṅ-twäṅ koor, French Protestant clergyman: b. Villeneuve-de-Berg, Ardiche, France, 17 May 1696; d. Lausanne, Switzerland, 15 June 1760. He was one of the most prominent Protestant leaders of his time and is commonly regarded as the restorer of the Reformed Church in France. Consult Hugues, 'Antoine Court' (1872); Baird, 'The Huguenots and the Revocation of the Edict of Nantes' (1895).

Court. Although the word "court" is still used as a descriptive of the household of a reigning monarch and in connection with the official functions of royalty, it is now almost exclusively used in the United States and European countries in connection with judicial tribunals. The objects and powers of the institutions called courts in English-speaking countries and probably in all lands where such institutions are free and independent of the executive,

are: (1) The preservation of personal liberty, the enforcement of the criminal laws, and the punishment of all infractions of the penal code, the trial of persons arrested for violation of criminal laws, and the conservation of the public peace, order, and safety; (2) the preservation of property rights, the adjudication of disputes and controversies between individuals, corporations, and States, and the determination of all kinds of legal actions commonly known as civil suits.

The establishment of law courts, the growth and gradual increase of their jurisdiction and power, has marked, step by step, the advance of civilization, the increase of personal liberty, the rights of individuals to enjoy and to hold property, and to maintain suits for the preservation and enforcement of their civil liberties and the free and unrestrained enjoyment of their personal and real property. Almost every gain in these directions made by the courts of Great Britain in the increase of their authority and jurisdiction represented the acquirement by individuals of increased liberty and the enjoyment of their property rights, coupled with the curtailing of the prerogatives of the king, springing from the acquisition by the people of some great charter enlarging their liberties.

English Courts.— In very early days in England and in many of the European countries all of the power and jurisdiction now held by the law courts was vested in and exercised by the king or the executive ruler, commonly described as the throne. This was also true in the primitive administration of law among the ancients. Such judicial powers were exercised by the executive in early Rome and were delegated to many of the subordinate officers. In the States of Greece the king or chief magistrate was not alone a military leader, but was also the chief judicial officer, as is the case now in Oriental autocracies where the sovereign appoints deputies to act as judges subject to his right of review on appeal. This is the system in vogue at the present time in Persia and Turkey, where the deputies of the shah and the sultan respectively govern the various states and administer the laws. The early English kings held almost absolute judicial power; they were to all intents and purposes courts of law. The sole executive and judicial authority over whatever law there was, free from the will of the king, vested in his person and was exercised by him to such an extent that individual ownership and personal liberties were subordinated to his absolute whim and caprice. As a legal fiction the king was considered, even after the courts had assumed a large measure of independence, the head of the court, and in such sense the king is so treated purely as a matter of fiction at the present time in England, for in that country and throughout Great Britain all writs run in the name of the king. That the administration of justice was one of the prerogatives of the English king in early times is clearly shown by the fact that the king himself sat on circuit even as late as the rule of Edward IV. Regular courts had then been established but authority was still vested in the king to participate personally in the business of the courts. King James I. exercised what has been frequently termed the last judicial act of an English monarch when he settled the controversies between the courts of law and the court of chancery.

The first step toward the separation of the executive and judicial powers as jointly vested in the king came when King John was compelled to sign the Magna Charta, or Great Charter, in 1215. By the Great Charter the inconvenience caused by the court following the king's person was remedied, as far as private litigation was concerned, by the provision that *communia placita* — common pleas — should be held at some fixed place, and it was in this way that the court of common pleas was established in England and that the independence of the courts became a vested right of the people.

John Richard Green, in his 'History of the English People,' after commenting on the vagueness of some of the provisions of the Great Charter says:

> But all vagueness ceases when the Charter passes on to deal with the rights of Englishmen at large, their right to justice, to security of person and property, and to good government.

He also writes:

> A memorable article that lies at the base of our whole judicial system ran, "No freeman shall be seized, or imprisoned or dispossessed, or outlawed, or in any way brought to ruin; we will not go against any man or send against him, save by legal judgment of his peers, or by the law of the land."

Another section of the Great Charter reads as follows:

> To no man will we sell or deny, or delay, right or justice.

In summing up the beneficial effects of the Great Charter Mr. Green writes:

> The great reforms of the past are now formally recognized; judges of assize were to hold their circuits four times in the year, and the king's court was no longer to follow the king on his wanderings over the realm, but to sit in a fixed place.

During the reign of Edward I. judicial reforms of great importance were brought about. The king's court was divided into three distinct tribunals: 1. The court of exchequer, which took cognizance of all cases in which the royal revenues were concerned. 2. The court of common pleas, for the trial of suits between private persons. 3. The court of king's bench, which had jurisdiction in all matters that affected the sovereign as well as in pleas to the crown, or criminal cases that were expressly reserved for his decision. Each of these courts is provided with a distinct staff of judges.

Another judicial reform of even greater importance, was the establishment in the reign of Edward I., of an equitable jurisdiction, side by side, with that of the common law. By this measure was brought into existence the equity side of the court, and by it the law officers of the crown for the first time reserved to it, in its judicial capacity, the correction of all breaches of the law which the law courts had failed to express; equity jurisdiction assuming to correct that wherein the law was deficient by reason of its fixed rules and ancient precedents. This equitable jurisdiction, it will be seen, sprang from the defective nature and the technical and unbending rule of the common law, and was a great gain in the administration of justice. After the establishment of parliamentary government the courts took their law from the legislative enactment, and their jurisdiction was constantly widened and increased by the many legislative acts that were adopted from time to time.

The Court of King's Bench continued, however, to be migratory for some years, but

finally became fixed, like the other law courts, at Westminster. The judges of all the courts were appointed by the king, and could be removed by him at will, until during the reign of William III. (1701) it was enacted that the commissions of the judges should be *quamdiu se bene gesserint* instead of *durante bene placito*, as formerly, and they could be removed only upon an address to both Houses of Parliament. The chancellor, who presides over the equity jurisdiction, became subject to removal by the king at pleasure, his office being by political tenure.

It will accordingly be seen that it was not until the tenure of judicial office was made independent of the king, and the separation of the judiciary from the executive was made effectual, that the independence and power of the courts of law and equity were firmly established; and it was not until these reforms were brought about that the courts were organized and firmly established under the system which prevailed for two centuries prior thereto and so continued until modified by the Judicature Act of 1875, when the several superior courts of England, including the courts of chancery, admiralty, probate, divorce, and the London court of bankruptcy were consolidated into one supreme court consisting of two parts or divisions called respectively the high court of justice and the court of appeals.

The High Court of Justice has original jurisdiction in all causes of action, with appeal to jurisdiction in certain cases from inferior courts. It is a superior court of record, and in it is vested the jurisdiction previously exercised in common-law and equity cases, by the Court of Chancery, and the jurisdiction formerly exercised by the courts of Queen's Bench, and of Common Pleas at Westminster, the Court of Exchequer in revenue and common-law cases; the courts of admiralty and of probate, divorce and matrimonial causes, of common pleas, at Lancaster and at Durham and the other courts created by the commissions of assize, of oyer and terminer, and of jail-delivery. The ordinary judges of the High Court of Justice have equal power, authority, and jurisdiction, but they sit in three divisions: the chancery division, consisting of 5 justices with the lord chancellor as president; the king's bench division, consisting of 14 justices and the lord chief justice as president; and the probate, divorce, and admiralty division, consisting of 2 judges. The criminal jurisdiction of the court is exercised entirely by the king's bench division. The lord chancellor is not to be deemed a permanent judge of the court.

The Court of Appeals has appellate jurisdiction with such original jurisdiction as may be deemed necessary to dispose of cases on appeal. It consists of four *ex-officio* judges and five ordinary judges, appointed by letters patent. The ordinary members of the court are called lords justices of appeal. The four *ex-officio* judges are the lord chancellor, who is the president, the lord chief justice of England, the master of the rolls, the president of the probate division, and the presidents of the other divisions. The Court of Appeals is the superior court of record and the highest court of appeal except the House of Lords. In hearing ecclesiastical appeals the court is composed of judges and assessors, the latter being archbishops or bishops of the Church of England. The Supreme Court and any of the judges can sit at any time or place. By the Act, commissioners of assize on circuit are continued. Matters not deemed proper to be heard by a single judge are to be heard by divisional courts of the high court, consisting of three or not less than two judges. It is provided that the determination of these divisional courts is to be final unless the court gives special leave to either party to appeal. No appeal is to lie from any judgment of the High Court of Justice in criminal matters except for error of law, apparent on the record passed, regarding which no question has been reserved. In the Court of Appeals every appeal must be heard and the decision made by divisions of the court. Under this Judicature Act the High Court of Justice is divided into sections named after the old courts. These courts are so created as to administer justice under simpler forms without distinguishing between law and equity, giving, however, precedence to equitable principles. The lord chancellor, the two chief justices, the chief baron, and the master of the rolls, under this consolidation act, continued to be appointed with the same titles and ranks as before. The judges continued to go on circuit as under the old system. By the Judicature Act the House of Lords is enabled to sit for the hearing of appeals from the English court of appeals and the Scotch and Irish courts.

The Court of Marshalsea of the Household of the King of England, the Court of Our Lady the Queen, the Court of the Palace of the Queen at Westminster, and Her Majesty's Court of Review for the house of Peveril, and certain other minor courts of like import, were abolished by Act of 12 and 13 Victoria.

In addition to these high courts of England there are many inferior courts of criminal and civil jurisdiction. The lowest of criminal courts is that of a justice of the peace, sitting singly; sometimes the justices of the peace, two or more sitting at the same time, constitute a Court of Petty Sessions, and may dispose, in a summary way, of minor specific offenses. Besides inflicting punishment, the justice of the peace, or the Court of Petty Sessions, may commit persons for trial at the assizes. Justices at the Court of Quarter Sessions are commissioned to determine felonies and other offenses not including treason, murder, forgery, and bigamy. These, and other more serious offenses, are reserved for the superior courts, sitting under commission, or oyer and terminer, or of jail delivery in each county. The Assize Courts, so called, sit in general in each county twice a year. Sometimes several counties are united together for the assize court. In London there is a high criminal court known as the Central Criminal Court, and there are many inferior criminal courts known as police courts. The Court of King's Bench has the general supervision over all courts of criminal jurisdiction, and criminal cases may be moved into the King's Bench by writ of *certiorari*. There are a number of civil courts of inferior jurisdiction in which small claims may be litigated before justices or stipendiaries. In each county there are county courts and high courts of justice, for the determination of important civil actions.

The English courts are guided by precedents and by the former rules of the common law. When no former decision can be found, the

judges are guided by analogy to what has been held before on general principles of common law, and sometimes their decisions are based on fundamental principles of the Roman law. Crimes are defined by law, either statutory or by prescription. The English criminal courts have no power to create new crimes, nor can the courts impose any other penalty than those fixed by law.

United States Courts.— The judicial system of the United States, like the government, is of two kinds. It consists of the Federal courts, provided for by the Federal Constitution, and created and deriving their powers from Congress, and of the courts of the several States, created by the States, and provided with law by the legislatures of the several States. All of these courts follow the common law except where it has been repealed or statutory law provided in place of the common law. The judges of the Federal courts, including those of the Supreme Court of the United States, are appointed by the President with the consent of the Senate. The judges of the Federal courts hold office during good behavior, their appointment being for life. The Supreme Court of the United States has original jurisdiction in certain specified cases (see the section of this article on the United States Supreme Court below) and hears such appeals from the inferior courts as are especially provided for, and which will be referred to later.

The inferior Federal courts are the Circuit and the District courts. There are nine circuits in the United States, in each of which is one or more circuit judges. A justice of the Supreme Court occasionally sits with the Circuit Court judge. Sometimes the three sit together, but usually the Circuit Court judge sits alone. These Federal circuit courts exercise jurisdiction, concurrently with the State courts where the subject-matter of the litigation exceeds $2,000, exclusive of interest and costs, in value, and the United States is the plaintiff or is a party to the litigation, or where the suit is between citizens of different States. The Circuit Courts also have exclusive jurisdiction in cases of crime against the Federal government, except where otherwise provided. They have jurisdiction of cases for infringement of patents and copyright, and appeals lie to the Circuit Court of Appeals from the District Courts, where the amount involved in the litigation exceeds $50. The United States District Courts — every State is a district and has at least one District Court, some having two or more — are the bankruptcy and admiralty courts of the Federal government. They have jurisdiction in cases where an alien sues, and where the United States or an officer thereof or a foreign consul is a party. The District Courts also have jurisdiction of such crimes as are not capital as the United States takes cognizance of. The United States district court judge presides over a District Court.

The other Federal courts are the Court of Claims, the courts of the District of Columbia, and the Territorial courts.

The Supreme Court of the District of Columbia has jurisdiction corresponding to that of the State courts and similar to that of the Federal District Court. It consists of a chief justice and five associate justices. The District of Columbia has a Court of Appeals consisting of a chief justice and two associate justices.

The Court of Claims consists of five judges, and has authority to hear and determine all claims against the United States, founded upon any law of Congress or regulation of the executive department, or upon any contract, express or implied, entered into with or by the government. It can also be called upon to determine claims which may be referred to it by Congress, also all set-offs, counterclaims, claims of damage or other demand whatsoever on the part of the government against any persons making claims against the government in that court.

A Court of Private Land Claims was established by an Act of Congress of 3 March 1891 for the purpose of determining land claims under the laws of the United States, and land grants. It was provided that this court was to cease to exist 30 June 1903.

According to an Act passed 3 March 1891 the chief justice and associate justices of the Supreme Court were each assigned to a circuit; a Supreme Court justice, with the Circuit Court and District Court Judges to constitute, in each circuit, a Circuit Court of Appeals.

The courts of the Territories of the United States, the judges of which are named by the President and confirmed by the Senate, possess the powers especially conferred upon them by the act providing for their creation. These judges hold office subject to the will of the President. Such Territorial courts have been created for Porto Rico and all Territories acquired by the United States as the result of the Spanish-American war.

As the Federal as well as the State courts are the outgrowth of the English system of judicial tribunals, drawing their precedents from the common law, and being in a measure, so far as practice and precedents are concerned, a continuation of the English colonial courts, prior to the Revolutionary War, they have an equity and common-law side.

The several States of the Union have a system of courts similar in many respects to the Federal courts and those of England. Each State has a court of last resort, which hears and determines all questions of law and equity on appeal from the trial court. The highest court in most of the States is named the Supreme Court, although in many of the States, like New York, for instance, the court of last resort is the Court of Appeals, the Supreme Courts in the State of New York being trial courts, similar in jurisdiction to the Superior or Circuit Courts in many of the States. The judges of these State courts are elected for a term of years by popular vote, like other officers. The State courts have a separate criminal and civil jurisdiction, and the court of final appeal in each State settles all questions on appeal except where a violation of the Constitution of the United States is set up.

Each county in the separate States has its probate and other minor courts, and disposes of crimes and civil actions committed within the county. The counties and the towns in each county have justices of the peace and minor courts of limited jurisdiction, like those of the English system, which dispose of minor offenses and determine civil actions. The justices of the peace are usually committing magistrates, who

issue warrants of arrest, hold preliminary hearings, and commit offenders to await the action of the grand jury or the disposition of their cases by courts higher in criminal jurisdiction.

In the large cities and towns there are many police magistrates and justices of the peace to perform the same duties. In some towns and cities the magistrates and police justices are elected, and in others they are appointed by the mayor, as is the case in New York. There are also in each city minor courts which hear and determine civil actions.

Where a prisoner is held by a magistrate for trial, and is subsequently indicted, he or she is placed on trial on the indictment found, in a court of record of criminal jurisdiction, and, upon conviction, appeals in capital cases directly to the court of last resort. The decision of the court of last resort is final unless an infraction of the Constitution of the United States is alleged, and the case is then taken to the Supreme Court of the United States. In case the Supreme Court of the United States finds that a constitutional right has been violated, it orders a new trial of the prisoner. In the event of a decision adverse to the prisoner, the sentence imposed by the trial court is carried out.

A similar rule follows in cases of civil suit where the final appeal is taken to the Supreme Court of the United States. Such appeals from the State courts to the Supreme Court of the United States usually go up on a writ of error. There are, however, in many of the State courts, intermediary courts of appeal, as, for instance, in the State of New York there is the Appellate Division, which disposes of many appeals, and from which an appeal cannot be taken unless a constitutional right has been violated, except upon the consent of the court. In the State of New York the trial courts in civil actions, exclusive of such minor legal business as is disposed of by the Magistrates' and Municipal courts, are the Supreme court and the Surrogates' courts.

The Courts of Special Sessions determine cases of misdemeanor, and capital cases and other felonies are tried in the Courts of General Sessions. The first step in the criminal prosecution after the arrest of the prisoner is the arraignment before the magistrate or the justice of the peace, as the case may be. The prisoner is then either discharged or held, subject to the action of the grand jury, and his trial and various appeals follow as heretofore described.

As New York, second to London, is probably the home of more courts than any other place in the world, a brief *résumé* of the courts of that city may not be out of place here. The borough of Manhattan contains one of the largest judicial systems of the metropolis, and its system is carried out in the other boroughs of the city of New York.

Housed within the County Court-house are the 13 Trial Terms and the 7 Special Terms of the Supreme Court of the county of New York, and the two branches of the Surrogates' Court.

There are similar Supreme Courts throughout the other boroughs and the counties of the State of New York. The jurisdiction of the Supreme Court of the State of New York includes all the jurisdiction which belonged to the Supreme Court of the colony of New York and the Court of Chancery in England, on 4 July 1776, with the exceptions, limitations, and additions created by the constitution and laws of the State. In 1896 the Court of Common Pleas, the Superior Court, and the criminal court of oyer and terminer were merged into it. Sessions are held for the hearing of motions and *ex parte* business in the County Court-house in the borough of Manhattan, New York, beginning on the first Monday of each month. Special terms for equity cases and enumerated business are held in the court-house on the first Monday of each month excepting July, August, and September. Trial terms are held at the court-house — except Part 1., Criminal Term, which is held at the criminal courts building, beginning on the first Monday of each month, excepting July, August, and September, and on the third Monday of September. The Appellate Division meets on the fourth Monday of each month except August.

The Surrogates' Court consists of a trial and special term. This court has power to take proof of wills, to grant letters of administration, to direct and control estates and the settlement of accounts of executors and administrators, and to perform many other acts relating to probate business.

The criminal courts in the borough of Manhattan, New York, are Part 1., Trial Term of the Supreme Court, and the courts of general sessions of the peace. The first-named court has jurisdiction to hear and determine all crimes and misdemeanors triable within the county, and to deliver the jails of the county, according to law, of all prisoners therein. It has power to try all indictments sent to it from the recorder's sessions, or which may be removed into it from that court, which in the opinion of the justice may be proper to be determined therein. It is held in the Criminal Courts building on the first Monday of January, February, March, April, May, June, October, November, and December.

Three branches of the Courts of General Sessions of the Peace are held every month except July and August, when usually only one part is in session. These courts have a recorder, and also four judges known as judges of the Court of General Sessions. The latter are vested with the same power as a recorder, and, like him, are elected for 14 years at salaries of $12,000 a year each. This court has power to hear and determine, and punish according to law, all crimes and misdemeanors whatsoever, including crimes punishable by death and imprisonment for life, which are triable in the county of New York. Every conviction for a capital offense had in this court is reviewable as a matter of right upon a writ of error to the Supreme Court and the court of appeals, which courts may direct that a new trial be had.

The Court of Special Sessions for the Peace, as reorganized in the spring of 1895, occupies a position between the police and municipal courts and the Courts of General Sessions. Its jurisdiction extends to all misdemeanors. It is held by five justices appointed by the mayor, at salaries of $8,000 a year each, and the cases tried by it are sent to it by the various police courts. The accused, when brought before the police justice, may enter into a recognizance to appear for trial at special sessions. There is no jury trial in this court, and the accused, from the time of his appearance before the com-

mitting magistrate, has his election of trial here or in the Court of General Sessions. His election must be expressed in writing, and jury trial must be expressly waived if he elects to be tried by the court of special sessions. There are two divisions of the city for this court; the first comprises the boroughs of Manhattan and the Bronx, and the second the other three boroughs.

City Magistrate's Courts.— There are in New York 24 justices, called city magistrates, 12 for each of the two divisions of the city. They are appointed by the mayor at salaries of $6,000 a year each, except those of the boroughs of Queens and Richmond, who receive $5,000 a year. They hold the police courts of the city.

Appellate Division of the Supreme Court.— This court was established in 1896. Its jurisdiction covers appeals from the Supreme Court of the county of New York, and is final in all cases except those in which it certifies that questions are involved which should be passed on by the court of appeals. A subsidiary appellate court, known as the Appellate Term of the Supreme Court, sits to hear appeals from the city and district courts.

City Courts.— The City Court was formerly known as the Marine Court. It has no jurisdiction in equity. Its jurisdiction embraces the following cases: An action for the recovery of a sum of money, only where judgment can be rendered for not more than $2,000, or for the recovery of a chattel not worth more than $2,000. The city court has also jurisdiction to enforce a mechanic's lien and to foreclose a chattel mortgage not exceeding $2,000 in value.

The United States Circuit Court, the United States District Court, and the United States circuit court of appeals sit in New York.

Supreme Court of the United States.— The Supreme Court of the United States, created in 1789 after much discussion and consideration and after many attacks had been made upon its proposed jurisdiction, now consists of nine justices, including the chief justice. The chief justice and the associate justices are appointed by the President with the concurrence of the Senate. The justices are appointed for life, and receive a salary of $10,000 a year, with the exception of the chief justice, who is paid $10,500 a year. The justices have a retiring pension of the same amount upon reaching the age of 70 years. The court has original jurisdiction in all cases affecting ambassadors, other public ministers, and consuls, and those actions in which a State is a party. It has final jurisdiction in admiralty, patent, copyright, and revenue cases, and has power to declare void acts of Congress or of the United States which it finds in conflict with the Federal constitution. This great court has always upheld the national character of the Federal government, and has, while indicating the national policy, carefully guarded the reserved rights of the several States. Its decisions have not been confined to narrow questions of commercial law, but have interpreted the Constitution and established the welfare of the nation. Within the great powers exercised by it, it restricts congressional acts to constitutional limits. Its jurisdiction extends over sovereign States as well as over the humblest of its citizens. It has power to annul the statutes of any States in the Union whenever any such statute violates the Constitution and are in violence to civil right, the contracts, the currency, or the intercourse of the people.

Hampton L. Carson, in his 'History of the United States Supreme Court,' says:

> The establishment of the supreme court of the United States was the crowning marvel of the wonders wrought by the statesmanship of America. In truth the creation of the supreme court with its appellate powers was the greatest conception of the Constitution. It embodied the loftiest ideas of moral and legal power, and although its prototype existed in the superior courts of the various States, yet the majestic proportions to which the structure was carried became sublime. No product of government, either here, or elsewhere, has ever approached it in grandeur. Within its appropriate sphere it is absolute in authority. From its mandates there is no appeal. Its decree is law. In dignity and moral influence it outranks all other judicial tribunals of the world. No court of either ancient or modern time was ever invested with such high prerogatives.

The third article of the Federal Constitution provides for the establishment of the Federal courts. It embodies in three sections the system from which has been developed the greatest and wisest judicial system the world has ever known.

Section 1 vests the judicial power of the United States in one Supreme Court, and in such inferior courts as Congress may from time to time ordain and establish, and regulates the tenor of office of all Federal judges, prescribing their good behavior and guaranteeing their compensation against diminution.

Section 2 provides that the judicial power shall extend to all cases in law and equity arising under the Constitution, the laws of the United States, and treaties made, or which shall be made under their authority, to all cases affecting ambassadors, other public ministers and consuls, to all cases of admiralty and maritime jurisdiction; to controversies to which the United States shall be a party; to controversies between two or more States, between a State and citizens of another State, between citizens of different States, between citizens of the same State claiming lands under grants of different States, and between a State, or the citizens thereof, and foreign States, citizens or subjects. It also provides that all cases affecting ambassadors, other public ministers and consuls, and those in which a State shall be a party, the Supreme Court shall have original jurisdiction. In all the other cases before mentioned the Supreme Court shall have appellate jurisdiction both as to law and fact, with such exceptions and under such regulations as the Congress shall make. Section 2 also provides that the trial of all crimes, except in cases of impeachment, shall be by jury, and that such trials shall be held in the State where the said crime shall have been committed; but when not committed within any State, the trial shall be at such place or places as the Congress may, as by law, direct.

Section 3 provides: 1. Treason against the United States shall consist only in levying war against them, or in adhering to their enemies, giving them aid and comfort. No person shall be convicted of treason unless on the testimony of two witnesses to the same overt act or on confession in open court. 2. The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood or forfeiture except during the life of the person attainted.

Before the adoption of the Constitution the great importance of such a court as the Supreme

Court of the United States was discussed. As early as May 1783 Alexander Hamilton called attention to the grievous defect in the Articles of Confederation in failing to provide a Federal court and a court of last resort, especially for the settlement of matters involving foreign nations. In the 'Federalist' he wrote:

> Laws are a dead letter without courts which found and define their true meaning and operation. The treaties of the United States, to have any force at all, must be considered as part of the law of the land. Their true import, as far as respects individuals, must like all other laws, be ascertained by judicial determination. To produce uniformity in these determinations they ought to be submitted as a last resort to one supreme tribunal, and this tribunal ought to be instituted under the same authorities which form the treaties themselves.

James Madison and other statesmen of that day held practically the same view. It was from such ideas as these expressed by Mr. Hamilton and concurred in by his contemporaries that the Supreme Court of the United States took its rise, and when the main business of the Constitutional Convention was begun 28 May 1787 a provision for the creation of a national judiciary was suggested, among a series of 15 resolutions relating to the adoption of the Constitution, commonly known as the Virginia plan. The clause relating to the judiciary provided as follows:

> That a national judiciary be established, to consist of one or more supreme tribunals, and of inferior tribunals to be chosen by the national legislature. The judges to hold their office during good behavior, and to receive punctually, at stated times, fixed compensation for their services, in which no increase or diminution shall be made so as to affect persons actually in office at the time of such increase or diminution, that the jurisdiction of the inferior tribunals shall be to hear and determine, in the first instance, and the supreme tribunal in the *dernier ressort*, all piracies and felonies on the high seas, captures from an enemy, cases in which foreigners or citizens of other States applying to such jurisdiction may be interested, or which respect the collection of the national revenues, the impeachment of any national officers, and questions which may involve the national peace or honor.

A resolution that a national judiciary be established was unanimously passed by the convention, which was made up chiefly of lawyers and four judges. Then followed a vigorous and protracted discussion as to the formation and the method of selecting the various judges. John Rutledge was against establishing any national tribunal except a single supreme one, and he contended that the State tribunals might and ought to be left in all cases to decide in the first instance as to the right of appeal to the supreme national tribunal. He contended that to do otherwise was making an unnecessary encroachment on the jurisdiction of the States. He was supported in these contentions by Roger Sherman. After the various plans and suggestions had been fully discussed, the convention committed to the people of the United States, on 17 Sept. 1787, the Constitution, containing the Article (3) relative to the formation of the Federal judiciary.

The first Congress to meet after the ratification of the Constitution, which was summoned to meet in New York, as the seat of government, on 4 March 1789, did not convene until the beginning of April, and after the counting of votes it declared Washington President-elect. His inauguration followed on 30 April, but there was no Federal judge to administer the oath required by the Constitution, and this service was performed by Robert R. Livingston, the first chancellor of the State of New York under the constitution of that State of 1777. Having had its attention called in this striking manner to the fact that the new Federal government was without a single judge, Congress, the day after its organization, began the preliminary work for the establishment of a judiciary by appointing a committee, of which Oliver Ellsworth, one of the framers of the Constitution, and afterward chief justice of the Supreme Court, was chairman. The judicial Act which set in operation the Supreme Court of the United States, and the circuit and district courts of the United States substantially as it exists to-day, was the work of Ellsworth. It was approved by Washington 24 Sept. 1789.

The first section of this Act provides that the Supreme Court of the United States shall consist of a chief justice and five associate justices (now increased to eight) any four of whom shall constitute a quorum, and shall hold annually, at the seat of government, two sessions, the one commencing the first Monday of February, and the other the first Monday of August. The Senate promptly confirmed Washington's appointment of John Jay of New York to be the chief justice of the supreme court. Washington appointed and the Senate confirmed as associate justices: John Rutledge, of South Carolina; William Cushing, of Massachusetts; Robert H. Harrison, of Maryland; James Wilson, of Pennsylvania; and John Blair, of Virginia. Of these, Jay, Cushing, and Harrison had served as chief justices in their own States; Rutledge, Wilson, and Blair as the members of the convention that framed the Constitution. Harrison declined to serve, and his place was afterward filled by the appointment of James Iredell, of North Carolina.

The first Monday of February,—it was the first day of the month,—1790, being the day fixed for the opening session of the Supreme Court of the United States, in the city of New York, which was then the capital of the Federal government, Chief Justice Jay and Justices Cushing and Wilson appeared in the court room, which had been provided at the Exchange, Federal Hall being occupied by Congress. A quorum was not present and the court was adjourned to the following day, when, Justice Blair having arrived with Edmund Randolph, the first attorney-general, the Supreme Court of the United States was open for its first session. Chief Justice Jay wore on that occasion a robe of black silk with salmon-colored facings on the front and sleeves. This robe was, according to family tradition, the academic gown of a Doctor of Laws of the University of Dublin, which had recently conferred this decree upon the new chief justice. The associate justices wore the ordinary black robes which have since been used by all the members of the court. Richard Wenman was appointed "crier," and made proclamation that the Supreme Court was open. John Tucker, of Massachusetts, was appointed first clerk of the court. After a seal had been adopted the roll of attorneys and counselors was opened. The first name on the roll of counselors was that of Elias Boudinot, of New Jersey, a Revolutionary patriot, who was conspicuous in the Continental Congress and later in the first Congress of the United States. He was also first president of the American Bible Society.

The old distinction between attorneys and counselors was preserved for a time, but was afterward abolished. After holding a few formal sessions the court adjourned, for lack of business, 10 February. In 1791 the Supreme Court was removed to Philadelphia, the then seat of the Federal government, where it continued to sit during term time for 10 years, the court room being on the second floor of the city hall, at the corner of Fifth and Chestnut streets. In 1801 the court was removed to Washington, where it has remained ever since. On the day of the first meeting of the supreme court of the United States in the city of Washington, 4 Feb. 1801, John Marshall sat as chief justice for the first time. The supreme court at present consists of Chief Justice Melville W. Fuller, of Illinois, and Associate Justices John M. Harlan, of Kentucky; David J. Brewer, of Kansas; Henry V. Brown, of Michigan; Edward D. White, of Louisiana; Rufus W. Peckham, of New York; Oliver W. Holmes, of Massachusetts; Joseph McKenna, of California; and William R. Day, of Ohio.

LEWIS P. CLOVER.

Court of Appeals. See COURT.

Court of Appeals in Cases of Capture (1780–87), the chief federal court prior to the establishment of the supreme court, which in a sense grew out of it. From the nature of the revolt against Great Britain, the colonies were very loath to erect any new plenary power to decide their mutual disputes, which would also create new disputes between it and themselves. The first clash of jurisdictions came on the question of naval prizes. As early as the autumn of 1775 cruisers were capturing British vessels off the eastern coast, part under commission from Massachusetts, part from the Continental Congress (see CONTINENTAL NAVY); and Washington, conducting the siege of Boston, was appealed to for determination of conflicting claims, there being neither provincial nor Federal courts for trial and condemnation of captures. On 11 November he suggested to Congress to establish such a court; on the 25th it recommended to the colonies to erect them, reserving an appeal to itself or such persons as it appointed. The act, however, provided neither court, procedure, nor method of enforcement, did not define the source or limits of its jurisdiction, and had the same defects as the entire Confederation proceedings (see CONFEDERATION, ARTICLES OF). Washington criticised it on the first ground. Nor would Congress take original jurisdiction, but only appellate. Several appeals were referred to special committees; then, on 30 Jan. 1777, a special committee on revision of prize methods reported in favor of the creation of a standing committee of five to hear all such appeals. This was appointed, and the following March three more were added, but it was too large, and was shortly reduced to five again, with three as a competent quorum. But Washington's suggestion was evidently the right one, and on 5 Aug. 1777 it was moved to consider the establishment of a permanent court. This was discussed for over two years, and not finally acted on till 15 Jan. 1780. Meantime a case had come up which forced some new method on them. Four Connecticut men in the fall of 1778 had been captured by the British and compelled to help navigate the sloop Active toward New York; then in British hands; they recaptured it from the British crew, and were steering it for a patriot port when a Pennsylvania privateer captured them, and claimed the sloop as prize. A Pennsylvania jury gave the Connecticut men one fourth of the prize, and divided the rest between the privateers and the State of Pennsylvania. The Connecticut men appealed to Congress, which reversed the decision; the Pennsylvania judge refused to admit its authority, and ordered the sloop and cargo sold and the proceeds divided. (It should be said that the State admiralty act prohibited appeal or rehearings.) The committee thereupon refused to hear any more cases till its jurisdiction was settled. Congress resolved that such cases could not be left to self-interested State decision, but that it would not prejudice the Union by resort to force; and the Connecticut men only obtained their rights many years later through the supreme court. After futile conferences with State legislative committees, an act was passed establishing a Federal "Court of Appeals in Cases of Capture," to hold sessions first in Philadelphia, and then anywhere they pleased between Hartford, Conn., and Williamsburg, Va. But like all other enactments of the time, it was shorn of its needful powers: it could not fine or imprison for disobedience, the State courts were not to execute its decrees, and no marshal was appointed. No tenure, either of definite time or good behavior, was assigned to the judges. Three of these were appointed, but one of them died soon after, and the other two performed the duties for two years, when another resigned, and two others were chosen. But the cases were gradually decided after the war, and on 23 Dec. 1784 the docket was reported empty. The judges were still retained, but their salaries were abolished, except for a *per diem* allowance when in actual service. About this time the States began to constitute courts of appeal to take matters out of the hands of the Federal court. The defeated parties, however, insisted on appeals to the latter, and on 27 June 1786 Congress resolved that these should be heard. The last session of the court was on 16 May 1787 at Philadelphia, while the Convention of 1787 (see CONSTITUTION, FRAMING OF) was framing the supreme court. Consult: Carson, 'The Supreme Court of the United States: Its History' (1892).

Court-baron, in England, a court composed of the freeholders of a manor, presided over by the lord of the manor or his steward. These courts have long fallen into disuse.

Court of Chancery. See COURT.

Court of Claims. See COURT.

Court de Gébelin, Antoine, äṅ twän koor dė zhā-bė-lăṅ, French writer: b. Nimes 1725; d. Paris 10 May 1784. He was a son of Antoine Court (q.v.), and settled in Paris in 1763, after the death of his father. After 10 years he published from 1773 to 1784, 'Le Monde Primitif Analysé et Comparé avec le Monde Moderne,' which, after nine volumes had appeared, remained unfinished. It is a work of disproportioned erudition, on a plan too vast for the labors of a single individual. The other works by which his name is known are 'Lettres Historiques et Apologétiques en Faveur de la Religion Réformée' (1760), a work completed by him on materials left by his father; 'Histoire

Naturelle de la Parole,' extracted from his 'Monde Primitif' (Paris 1776). Toward the end of his life he became a believer in animal magnetism, which was at that time much in vogue. He defended Mesmer, the author of the theory, in his 'Lettre sur le Magnetisme Animal' (1784).

Court of High Commission, a court which was established in Queen Elizabeth's reign, and exercised powers like those which during the reign of Henry VIII. had been entrusted to Lord Cromwell. The judges had the power of arresting suspected persons, imprisoning, torturing them, and causing them to accuse their confederates or their friends. They could impose new articles of faith, and impose them on recalcitrant consciences by compulsion of the severest and most odious kind.

Court of Honor, a court of chivalry, of which the lord high constable was judge. It was a continuation of what in the time of Henry IV. was called *curia militaris,* military court.

Court of Lions. See ALHAMBRA.

Court of Love (Fr. *cour d'amour*), in mediæval France and Germany, a tribunal composed of ladies illustrious for their birth and talent, whose jurisdiction, recognized only by courtesy and opinion, extended over all questions of gallantry. Such courts existed from the 12th to the 14th century, while the romantic notions of love which characterized the ages of chivalry were predominant. The decisions were made according to a code of 31 articles, which have been preserved in a MS. entitled 'De Arte Amatoria et Reprobatione Amoris,' written by André, royal chaplain of France, about 1170. Some of the troubadours were often present to celebrate the proceedings in verse, and the songs of these minstrels were not unfrequently reviewed and judged by the tribunals. Among the ladies who presided were the Countess De Die, called the Sappho of the Middle Ages, and Laura de Sade, celebrated by Petrarch. There was such a court in Provence in the palmy days of the Troubadours. The following case was submitted to their judgment: A lady listened to one admirer, squeezed the hand of a second, and touched with her toe the foot of a third. With which of these three was she in love? King René of Anjou attempted in vain to revive the courts of love, and the last imitation of them was held at Rueil at the instance of Cardinal Richelieu, to judge a question of gallantry, which had been raised in the Hôtel de Rambouillet.

Court-Martial. See LAW, MILITARY.

Court-plaster, so called because originally applied by ladies of the court as patches on the face; black, flesh-colored, or transparent silk varnished over with a solution of isinglass, which is often perfumed with benzoin. It is used for covering slight wounds.

Court, Presentation at, a formal presentation to the sovereign of Great Britain of persons whose status entitles them to that honor. It takes place either at St. James' Palace, at a levee, intended for gentlemen only, or at Buckingham Palace, a drawing-room, where both ladies and gentlemen appear. The days when levees and drawing-rooms are to be held are always announced some time beforehand. It is difficult in the present day to define exactly who may and who may not be entitled to be presented. Members of families of the nobility and landed gentry, diplomats, members of the House of Commons, persons holding high offices under the crown, judges, magistrates, Church dignitaries, officers in the army and navy, persons who have attained distinction by eminence of any kind, and the wives and daughters of the same classes, form the larger number of those presented at levees and drawing-rooms. Persons are often presented on entering on some office or attaining some dignity. Any one who has been once presented is entitled to appear at any future levee or drawing-room without a new presentation. The whole arrangements connected with presentations are under the supervision of the lord chamberlain, in whose office in St. James' Palace information is given to all persons wishing to be presented. The names of ladies and gentlemen desiring presentation, and of the ladies, noblemen, and gentlemen who are to present them, have to be submitted to the sovereign for approval, and there is a strict exclusion of persons of damaged reputation, whatever their rank. Court dress or official uniform must be worn. A British subject who has been presented at St. James' may on any after occasion claim to be presented by the British minister at any foreign court.

Court of Private Land Claims. See COURT.

Court of Special Sessions. See COURT.

Courtat, Louis, loo-ē koor-tä, French painter: b. Paris 1847. He was a pupil of Cabanel; has exhibited in the Salon, and one year won a first class medal. His best-known work is 'Leda,' owned by the French government.

Courtenay, koort'nā or kėrt'nā, **Edward Henry,** American mathematician: b. Maryland 1803; d. Charlottesville, Va., 21 Dec. 1853. He was graduated at West Point in 1821, and was professor of philosophy there 1821–34, and professor of mathematics at the University of Pennsylvania 1834–6. After several years devoted to civil engineering he was professor of mathematics in the University of Virginia 1843–53. He published: 'Treatise on Differential and Integral Calculus'; and 'Calculus of Variations.'

Courtesy, or **Curtesy,** kėr'tē-sī, a form of tenure by which a man who has married a woman seized of an estate of inheritance, and has by her issue capable of inheriting her estate, on the death of his wife holds the lands for his life.

Courtesy Title, a title assumed by or given to any person by common consent, as an act of courtesy or respect, not of absolute right. Thus in England, the eldest son of a duke is allowed the courtesy title of marquis; the eldest son of a marquis that of earl; the eldest son of an earl that of viscount, etc. The younger sons of peers above the rank of viscount are allowed the courtesy title of lord; the daughters that of lady.

Courthope, kōrt'hōp, **William John,** English scholar: b. 17 July 1842. He was educated at Harrow and Oxford, was first civil service commissioner in 1892, and professor of poetry at Oxford 1895–1901. He has edited an edition of Pope, and is author of 'Ludibria Lunæ' (1860); 'Paradise of Birds' (1870); 'Life of

Addison' (1882); 'History of English Poetry' in progress Vol. I (1895), Vol. II (1897); 'Life in Poetry'; 'Law in Taste' (1901); 'The Longest Reign.'

Courtmans, koor-măn, **Joanna Desideria Berchmans,** Flemish poet and novelist: b. Oudegem, East Flanders, 6 Sept. 1811; d. Maldegem, 6 Sept. 1890. She was married in 1836. Besides dramas and poems, she wrote 22 volumes of stories. She excelled particularly in her descriptions of the life of the common people. The most notable of her tales are: 'The Hunter's Gift'; 'Dame Daneel'; 'The Cowherd'; 'Aunt Clara's Bonnet.'

Courtney, koort'nā or kĕrt-nā, **Frederick,** Canadian prelate: b. Plymouth, Eng., 5 Jan. 1837. He was graduated at King's College, London, in 1863, entering the Anglican priesthood in 1865. From 1876 to 1880 he was stationed in New York; was rector of St. James' Church, Chicago, 1880–2; and rector of St. Paul's, Boston, 1882–8. In 1888 he was consecrated bishop of Nova Scotia.

Courtney, koort'nĭ, **William Leonard,** English author: b. Poona, India, 5 Jan. 1850. He was educated at Oxford, became editor of the 'Fortnightly Review' in 1894 and has served on the editorial staff of the *Daily Telegraph.* He has published: 'The Metaphysics of John Stuart Mill' (1879); 'Studies on Philosophy' (1882); 'Constructive Ethics' (1886); 'Studies New and Old' (1888); 'Life of John Stuart Mill' (1889); 'Studies at Leisure' (1892); 'Kit Marlowe,' a play ((1893); 'The Idea of Tragedy' (1900); 'Undine' (1902).

Courtois, Bernard, bār-nār koor-twä, French chemist: b. Dijon 1777; d. Paris 27 Sept. 1838. He was trained in pharmacy, and entered Fourcroy's laboratory in the École Polytechnique. He had to join the army in 1799, but after his discharge resumed his chemical work with Thénard and Séguin. In conjunction with the latter he discovered morphine in opium, but nothing was published on the subject till Séguin's paper long after, and Courtois' share has consequently been overlooked. In 1804 he began work on nitrate of sodium, the process consisting in decomposing nitrate of calcium by the carbonate of sodium obtained from kelp. In the course of his operations he observed that the iron vessels were corroded if the liquors from which the sodium salts had been crystallized were kept in them for a time. Investigating the cause of this, he found that on distilling the liquors with sulphuric acid a body with a splendid purple vapor was liberated. He examined it and ascertained some of its properties; for instance, its formation of a detonating compound with ammonia, and then gave a specimen of it to Clément, who read a paper on it, and ultimately resigned the investigation to Gay Lussac. This was the first discovery of iodine. In 1815 his nitre manufacture was ruined, and thereafter he had a precarious livelihood by making various chemical products.

Courtois, Gustave Claude Étienne, güs-täv klōd ā-tē-ĕn koor-twä, French painter: b. Pusey 18 March 1852. He studied at Paris as a pupil of Gérôme, first exhibited in the Salon in 1876; won the first-class medal at the Paris Exposition of 1889. His works include: 'The Death of Archimedes'; 'Narcissus' (in the Luxembourg); 'Dante and Virgil in Hell'; 'Bayadere'; 'The Burial of Atala'; and a number of portraits.

Courtois, Jacques, zhäk (It. Jacopo Cortese), surnamed le Bourguignon (It. Il. Borgonone). French painter: b. St. Hippolyte, Doubs, 1621; d. Rome 14 Nov. 1676. He was especially eminent in battle-pieces. His wife dying of poison, which he was suspected of having administered, he took the habit of a lay brother of the Jesuits, with whom, though he still practised his art, he remained till his death. His brother William (d. 1679) was also an eminent painter who excelled in historical pieces, and assisted Jacques in some of his works.

Courtrai, koor-trā, Belgium, a fortified town in the province of West Flanders, on the Lys River, 26 miles south of Bruges. It is well built, having handsome and spacious streets, and a fine Grande Place, with several other squares. Its manufactures are table linens, lace, which is celebrated for its beauty of design and exquisite workmanship, cambrics, cotton goods, etc., and it has extensive bleaching and dyeing works. Here, in 1302, took place the "battle of spurs" between the French and Flemings. Pop. (1900) 34,000.

Courtship of Miles Standish, The, the title of a poem by Longfellow. It is written in hexameter measure and was first published in 1858.

Cousin, Jean, zhŏn koo-zăn, French artist: b. Soucy, near Sens, France, 1501; d. Sens about 1590. He is generally regarded as the earliest French historical painter. He chiefly painted on glass, but his 'Last Judgment,' painted on canvas for the convent of the Minims at Vincennes, is esteemed an excellent work. He was the author of 'Livre de Perspective' (1560); and 'Livre de Portraiture' (1571). See Firmin-Didot, 'Etude Sur Jean Cousin' (1872).

Cousin Michel, mē'hĕl, a nickname sometimes applied to a German, as John Bull is to an Englishman, or Brother Jonathan to an American.

Cousin, Victor, vēk-tor, French philosopher: b. Paris 28 Nov. 1792; d. Cannes 2 Jan. 1867. He founded a school of eclectic philosophy; combining the doctrines of the Scotch school of Reid and Stewart, based on sensation, with those of Schelling and Hegel, which rest on the opposite principle of idealism or intuition. He was not an original thinker in philosophy, but possessed in a high degree the faculty of clear exposition and for that reason his lectures and his writings enjoyed a great popularity. He rendered a memorable service both to philosophy and literature by his translation of 'Plato' (1840). Besides his 'Fragments philosophiques' (1826) and other works on that theme, he is author of a few biographical sketches, mostly of characters related to the spiritual and intellectual movements of the 17th century: as 'Jacqueline Pascal'; 'Mme. de Longueville'; 'Mme. de Hautefort'; 'French Society in the 17th Century.' As a lecturer and philosophical writer Cousin was distinguished by a rare combination of eloquence, enthusiasm, and clearness of exposition. He possessed a beauty of style such as no modern or ancient

philosopher excepting Plato has equaled. He rendered a very valuable service to his native land in the part he took in the organization of primary instruction. In 1831, under a commission from the French government, he visited Germany to study educational methods there, and the 'Rapport sur l'Etat de l'Instruction Publique' published on his return had powerful influence on subsequent legislation. See Janet, 'Victor Cousin et son Œuvre' (1885); Jules Simon, 'Victor Cousin' (1887); Taine, 'Les Philosophes Classiques du XIXe Siècle' (1888); B. Saint-Hilaire, 'Victor Cousin, sa vie, sa Correspondence' (1895).

Cousins, kŭz'enz, **Samuel**, English engraver: b. Exeter 9 May 1801; d. 7 May 1887. He first brought himself into notice by his engraving of Lawrence's 'Lady Acland and her Children,' in 1826. In 1835 he was elected A.R.A., and in 1855 became the first Royal Academician engraver. Of his numerous works the following may be mentioned: 'Pope Pius VII.' (1827), after Lawrence; 'Bolton Abbey in the Olden Time' (1837), after Landseer; 'Queen Victoria' (1838), after Chalon; 'The Maid and the Magpie' (1862), after Landseer; 'Yes or No' (1873), after Millais; 'Simplicity' (1874), after Reynolds; 'Cherry Ripe' (1881), and 'Pomona' (1882), after Millais.

Coustou, Guillaume, gē-yōm koo-stoo, French sculptor: b. Lyons 25 April 1678; d. Paris 20 Feb. 1746. He was a brother of Nicolas Coustou (q.v.) whom he succeeded as director of the Academy of Fine Arts. Among his works the monument of the Cardinal Dubois, in the Church of St. Roch, is much esteemed.

Coustou, Guillaume, French sculptor: b. Paris 1716; d. there 1777. He was eldest son of the preceding, and on him Joseph II., during his stay in Paris, conferred with his own hands the order of St. Michael. The statues of Venus and Mars, larger than life, which he made in 1769 for the king of Prussia, gained universal admiration. His monument of the dauphin and dauphiness, parents of Louis XVI., in the cathedral of Sens, bears the character of majestic simplicity.

Coustou, Nicolas, nĭk-ō-lä, French sculptor: b. Lyons 9 Jan. 1658; d. Paris 1 May 1733. He is admired for his ability in grouping and delicacy in design, although a tendency to an affected refinement, then becoming common, is observable in his works. His 'Descent from the Cross,' in the Cathedral in Paris, is particularly valued. The younger brother was a worthy disciple of the elder.

Couthon, Georges, zhôrzh koo-tôṅ, French revolutionist: b. Orcet 1756; d. Paris 28 July 1794. Immediately previous to the Revolution he had made himself conspicuous as a liberal in the provincial assembly of Auvergne, and had gained considerable popularity by the gratuitous assistance he afforded the poor. Some time after the Revolution he was chosen a member of the national assembly, where he soon forfeited his character for mildness and amiability, and allying himself with Robespierre, aided and abetted the latter in all his atrocities. On the downfall of Robespierre's party Couthon shared, along with him and St. Just, in the decree of arrest pronounced by the Convention on 9th Thermidor. The same day he and his compeers were seized in the Hôtel de Ville, where, in the scuffle that ensued, Couthon was nearly trampled to death, but survived sufficiently to be guillotined next day.

Coutts, koots. See Burdette-Coutts.

Coutts, Thomas, Scottish banker: b. Edinburgh, 7 Sept. 1753; d. London 24 Feb. 1822. With his brother James he founded the banking house of Coutts & Company in London, and on the latter's death in 1778 became sole manager. Keen and exact in matters of business, although charitable and hospitable in private, he left a fortune of some $4,500,000. By his first wife he had three daughters, who married respectively the Earl of Guilford, the Marquis of Bute, and Sir Francis Burdett. His second wife subsequently married the Duke of St. Albans, and at her death left the bulk of her property to Miss (now Baroness) Burdett-Coutts, daughter of Sir Francis Burdett.

Couture, Thomas, to-mä koo-tür, French historical and genre painter: b. Senlis, 21 Dec. 1815; d. Villiers-le-Bel, near Paris, 30 March 1879. His best picture is 'Les Romains de la Decadence' (1847), now in the Louvre. Among other works are 'Une Veuve'; 'Le trouvère' (1844); 'Joconde' (1847); and 'The Volunteers of 1793,' now in the Boston Museum of Fine Arts.

Couvade, koo-väd', a curious custom prevalent in ancient as well as modern times among primitive races in all parts of the world. After the birth of a child the father takes to bed, and receives all the delicate food and careful nursing which, among civilized peoples, is given to the mother. This custom was observed, according to Diodorus, among the Corsicans; and Strabo states that it existed among the Iberians. Many travelers from Marco Polo downward have met with a similar custom among the Chinese, the Dyaks of Borneo, the negroes, the aboriginal tribes of North and South America, etc. The Indians explain it by saying that descent is directly from the father, while anthropologists suggest that it is a ceremony by which the father proclaims his relation to the new-born child.

Covariant. See Invariants.

Covenant, the first bond or oath drawn up by the Scottish reformers, and called by them a Covenant, was signed in the winter of 1557, on the second coming of Knox to Scotland; another signed by King James, and called the King's Covenant, was signed in 1580. These documents, which it is difficult to characterize by an abstract, are given at length in Burton's 'History of Scotland.' After the union of the crowns of Scotland and England (1603), as the Stuarts favored the Episcopal churches, whose hierarchical form seemed fitted to promote their despotic views, the dangers which threatened Presbyterianism brought its followers in Scotland to a closer union; and when, in 1637, the new liturgy, modeled after the English, was ordered to be introduced into their churches, disturbances arose, which ended in the forming of a new Covenant the following year. This was called the National Covenant. The subscription of it began in the Grayfriars' Church, Edinburgh, 28 Feb. 1638. Copies were circulated throughout the country for general signature, many of which are still extant. The Covenant, with the confession of faith which it embodied, was ratified by the General Assembly at Glasgow, 21

Nov. 1638, and by the Scottish parliament in 1640. It was signed, along with the Solemn League and Covenant, by Charles II. on his landing in Scotland in 1650, and again at his coronation at Scone, 1 Jan. 1651. The Solemn League and Covenant was an agreement entered into by the English Parliament with the Scottish nation during the civil war in the reign of Charles I. In 1642 the Parliament had applied to the Scots for aid, and the application was pressed more earnestly in the following year. The Covenanters, who were then masters of Scotland, demanded that the English Parliament should take the Covenant, and assimilate the doctrine and discipline of the churches of the two nations. In consequence of this stipulation, Sept. 25, 1643, both Houses of Parliament met at Saint Margaret's Church, Westminster, along with the Assembly of Divines and the Scottish commissioners, to take the Covenant, which had been modified by the Assembly. After prayers and sermons, all present held up their hands in testimony of assent to it; and afterward, in their several Houses, subscribed it on a Parliament roll. The House of Commons ordered it to be taken by all persons in their respective parishes next Lord's Day. Though it was subscribed by Charles II. when he could not well help himself, he had little love for it; and in 1661 it was burned by the hangman, and in 1662 abjured by act of Parliament, in both England and Scotland. See COVENANTERS.

Covenant, an agreement between two or more persons, entered into by deed, whereby one of the parties promises the performance or non-performance of certain acts, or that a given state of things does or shall, or does not or shall not exist. It differs from an express assumpsit in that it must be by deed. Affirmative covenants are those in which the covenanter declares that something has already been done, or shall be done in the future. Such covenants do not operate to deprive covenantees of rights enjoyed independently of the covenants. Auxiliary covenants are those which do not relate directly to the principal matter of contract between the parties, but to something connected with it. Collateral covenants are those which are entered into in connection with the grant of something, but which do not relate immediately to the thing granted. Concurrent covenants are those which are to be performed simultaneously. Declaratory covenants are those which serve to limit or direct uses. Dependent covenants are those in which the obligation to perform by one is made to depend upon the performance by the other. Covenants for title are those covenants in a deed conveying land which are inserted for the purpose of securing to the grantee and covenantee the benefit of the title which the grantor and covenanter professes to convey. Those in common use are five in number in England,—of seisin, of rights to convey, for quiet enjoyment, against encumbrances, and for further assurance, —and are held to run with the land. There is beside, in the United States, a covenant of warranty which is more commonly used than any of the others. The covenants of seisin, against incumbrances, and right to convey, are generally held to be *in præsenti* and not assignable.

Covenanters, in Scottish history, the name given to the party which struggled for religious liberty from 1637 on to the Revolution; but more especially applied to the insurgents who, after the passing of the act of 1662 denouncing the Solemn League and Covenant as a seditious oath (see above article), took up arms in defense of the Presbyterian form of Church government. The Presbyterian ministers who refused to acknowledge the bishops were ejected from their parishes and drew around them crowds of their people on the hillsides, or any lonely spot, to attend their ministrations. These meetings, called "conventicles," were denounced as seditious, and to frequent them, or to hold communication with those frequenting them, was forbidden on pain of death. The unwarrantable severity with which the recusants were treated provoked them to take up arms in defense of their opinions. The first outbreaks took place in the hill country on the borders of Ayr and Lanark shires. Here at Drumclog, a farm near Loudon Hill, a conventicle was attacked by a body of dragoons under Graham of Claverhouse, but were successful in defeating their assailants (1679). The murder of Archbishop Sharp on Magus Moor, and this defeat, alarmed the government, who sent a large body of troops to put down the insurgents, who had increased in number rapidly. The two armies met at Bothwell Bridge, where the Covenanters were totally defeated (22 June 1679).

In consequence of the rebellious protests called the Sanquhar Declaration, put forth in 1680 by Cameron, Cargill, and others, as representing the more irreconcilable of the Covenanters (known as Cameronians), and a subsequent proclamation in 1684, the government proceeded to more severe measures. An oath was now required of all who would free themselves of suspicion of complicity with the Covenanters; and the dragoons who were sent out to hunt down the rebels were empowered to kill anyone who refused to take the oath. During this "killing-time," as it was called, the sufferings of the Covenanters were extreme; but, notwithstanding the great numbers who were put to death, their fanatic spirit seemed only to grow stronger. Even after the accession of William some of the extreme Covenanters refused to acknowledge him owing to his acceptance of episcopacy in England, and these formed the earliest dissenting sect in Scotland.

Covent (kŭv ĕnt) **Garden** (corrupted from Convent Garden, originally the garden of the Abbot of Westminster), is a spacious square in London, celebrated for a great market of fruit, vegetables, and flowers. The square was formed about 1631 from the designs of Inigo Jones, and has the arcade or piazza on the north and northeast side, Tavistock Row on the south, and the Church of Saint Paul's on the west. In the 17th century Covent Garden was a very fashionable quarter of the town. The scene of one of Dryden's plays is laid here, and frequent allusions are made to the place in plays of Charles II.'s time. The market, now so famous, appears to have originated about 1656 in a few wooden sheds and stalls. The first theatre erected here was built in 1733. It was burned in 1808, rebuilt from a design by Smirke, burned in 1856, and since wholly rebuilt. Covent Garden is for a stranger one of the sights of London, and is seen to greatest advantage about 3 o'clock on a summer morning; Tuesday, Thursday, and Saturday being the principal market days.

Coventry, kŭv'ĕn-trĭ, England, city in the county of Warwick, 85 miles northwest of London. It is one of the oldest cities in England, formerly a walled town. A Benedictine monastery was founded here in 1044 by Earl Leofric and Lady Godiva (q.v.), his wife. Many of the buildings, the cathedral among them, were destroyed by Henry VIII. Parliaments were convened here by the earlier monarchs of England, several of whom occasionally resided in the city. Pageants and processions were popular in the old days, and they still have many admirers. Some of the houses and a few of the narrow and irregular streets of the 15th and 16th centuries are in existence. Coventry has now several fine churches. Its boundaries have been extended because of the expansion of its industries. Its chief manufactures are bicycles, tricycles, ribbons, and fringes. The city owns its own gas, electrical, and water plants; it has public baths, an excellent system of sewerage, libraries, a technical school, and other public institutions.

Coventry, R. I., a town in Kent County, situated on the Pawtucket River, and the New York, New Haven & Hartford Railroad. The chief industries are the manufacture of cotton and wool. There is also some agricultural interest. The town is noted as the home of Gen. Nathanael Greene (q.v.). Pop. (1900) 5,279.

Coventry Plays, The, a series of 42 old plays exhibiting the characteristics of both the old English Morality and Mystery plays. Three complete sets of such dramas have descended to modern times: the 'Chester,' the 'Towneley,' and the 'Coventry' mysteries; and from these we derive nearly all our knowledge of the early English drama. Coventry was formerly famous for the performance of its Corpus Christi plays by the Gray Friars. These plays contained the story of the New Testament, composed in Old English rhythm. The earliest record of their performance is in 1392, the latest in 1589. The Coventry plays were published in a volume by the Shakespeare Society in 1841, under such titles as 'The Creation,' 'The Fall of Man,' 'Noah's Flood,' 'The Birth of Christ,' 'Adoration of the Magi,' 'Last Supper,' 'The Pilgrim of Emmaüs,' 'The Resurrection,' 'The Ascension,' 'Doomsday.'

Cov'erdale, Miles, English bishop and reformer: b. probably at Coverdale, Yorkshire, 1488; d. February 1568. He was educated at Cambridge, entered the convent of the Augustine friars, and was ordained a priest at Norwich in 1514. He was led some years afterward to embrace the reformed doctrines, and, having gone abroad, is said to have assisted Tyndale in translating the Pentateuch. In 1535 his own translation of the Scriptures appeared, with a dedication to Henry VIII., being the first printed version of the entire Bible. (See BIBLE.) In 1538 he was engaged in superintending at Paris the printing of a revised English version, the greater part of the impression of which was seized and destroyed by the ecclesiastical authorities. The printing presses and types, however, escaped the inquisitors, and being brought over to England, enabled Cranmer's, or the Great Bible, to be printed. The Prayer-book version of the Psalms is from the Great Bible. After the execution of his patron, Cromwell (1540), Coverdale went abroad. Having returned in 1548 he was made almoner to Queen Catharine Parr. In 1551, during the reign of Edward VI., he was appointed bishop of Exeter, but was ejected on the accession of Mary, and thrown into prison. After two years' confinement he was liberated, and proceeded first to Denmark, and subsequently to Geneva, where he assisted in preparing the Geneva Bible (1560), the favorite Bible of the Puritans. On the accession of Elizabeth he returned to England, but his recently acquired views on ecclesiastical ceremonies prevented his being restored to his see of Exeter. He was, however, made rector of St. Magnus, London Bridge. The third centenary of the publication of his Bible was celebrated by the clergy throughout the churches of England 4 Oct. 1835. His writings are numerous. Consult 'Memorials of Miles Coverdale' (1838), which contains a bibliography; Fry, 'The Bible by Coverdale' (1867).

Covered Way, in fortification, a space of ground 30 feet broad, on the outer edge of the ditch, above the counterscarp and next the glacis, ranging round the works of a fortification. It affords a safe communication round all the works, facilitates sallies and retreats and the reception of reinforcements, and its parapet protects the fortifications in its rear.

Coverley, Sir Roger de. (1) The name given by Addison to a fictitious character whose adventures were related in the 'Spectator'; (2) a Scotch air and dance, known to the Americans as 'The Virginia Reel.'

Coverly, kŭv'ĕr-lĭ, **Robert,** American composer: b. Oporto, Portugal, 6 Sept. 1863. He has written numerous successful topical songs and piano pieces, including the march, 'The Passing Regiment,' and a 'Spanish Gypsy Dance.'

Coverture, kŭv'ĕr-tūr, a legal term applied to the position of a woman during marriage, because she is under the cover or protection of her husband. See LAW OF HUSBAND AND WIFE.

Covilhao, kō-vēl-yäñ, Portugal, a town in the province of Beira, on the southeast slope of the Serra da Estrella, some 25 miles southwest of Guarda. In the neighborhood there are noted sulphurous baths. The town contains dyeworks, and important cloth factories. Pop. (1900) 15,527.

Co'ville, Frederick Vernon, American botanist: b. Preston, N. Y., 23 March 1867. He was educated at Cornell University and was instructor in botany there 1887–8, and assistant botanist in the United States Department of Agriculture 1888–93. Since the last named year he has been chief botanist of that department, as well as curator of the United States National Herbarium. He has published: 'Botany of the Death Valley Expedition.'

Covington, kŭv'ĭng-ton, Ga., a town and the county-seat of Newton County, 40 miles east of Atlanta, on the Georgia and Central of Georgia R.R's. It has a good local trade. Pop. (1900) 2,062.

Covington, Ind., the county-seat of Fountain County, situated in the northwestern part of the State, on the Wabash River, the Wabash and Erie Canal, and the Cleveland, Cincinnati, Chicago & St. Louis and the Wabash railroads. It exports live stock and agricultural produce, and has several iron foundries. Pop. (1900) 2,213.

Covington, Ky., city and county-seat of Kenton County, on the Ohio River opposite Cincinnati, with which it is connected by a handsome suspension bridge, 2,250 feet long, and costing $2,000,000. It is the northern terminus of the Kentucky Central Railroad, and is also on the Louisville, Cincinnati & Lexington Railroad. It is a residence town for Cincinnati business men and is the see of a Roman Catholic bishop.

Business Interests.— Covington is the farming, live stock, and whiskey-producing trade centre of central Kentucky, and has steamer connections with all ports on the Ohio. According to the Federal census of 1900 there were 403 manufacturing establishments, with $4,729,786 capital and 3,898 hands, and having annual products valued at $6,610,082. The principal manufactories are distilleries, cotton and woolen-mills, rolling-mills, and tobacco factories. In 1899 there were four national banks, with $1,150,000 capital, and several daily and weekly newspapers.

Public Interests.— Covington is built on a beautiful plain, and has an area of over 1,350 acres. The most notable buildings are the combined city hall and court-house; the United States government building, including the post-office and Federal court rooms; the public library, and the Hospital of St. Elizabeth. At the end of the school year 1897–8 there were 12 public schools, with 4,334 pupils and 120 teachers, a public high school for white children and the William Grant High School for colored, the Academy of Notre Dame, and the Rugby School.

History.— Covington was settled in 1812; laid out in 1815, and incorporated as a city in 1834. Pop. (1900) 42,938.

Covington, Tenn., county-seat of Tipton County, on the Illinois Central Railroad. It has an export trade in the agricultural products of the surrounding region, and has cotton-mills, a cotton compress, and saw-mills. Pop. (1900) 2,787.

Covode, John, American congressman: b. Westmoreland County, Pa., 17 March 1808; d. 11 Jan. 1871. He was a farmer's lad of Dutch blood, and became a coal dealer, a woolen manufacturer, and a railroad owner. He entered public life as a Whig, served two terms in the legislature, was sent to Congress in 1854 by the Anti-Masons (see ANTI-MASONRY), and re-elected 1856 as a Republican, serving by regular re-elections till 1863. In 1859 he was appointed chairman of the special committee to investigate President Buchanan's conduct in forcing through the Lecompton Bill (see title below, and LECOMPTON CONSTITUTION), and his report was valuable ammunition for the Republican party. He was a member of the committee on the conduct of the war. After Johnson's accession he was sent South to aid in that President's reconstruction policy, but was recalled for lack of sympathy with it. In 1868 he was again elected to Congress, and was a strong opponent of Johnson. In 1869 he was chairman of the Republican State Committee of Pennsylvania. He was an eager, impulsive man, with the friendships and the enmities natural to such a temperament, but respected for his entire honesty.

Covode Investigation, 1860. President Buchanan, in the struggle to have Congress validate the Lecompton Constitution (q.v.), was urged by the party organs to save the unity of the Democratic party, which was menaced with irremediable division, by using the patronage at his disposal to bring the hesitating members into the ranks. In the debates at the opening of the 36th Congress 1859–60, two anti-Lecompton Democrats alleged that he had attempted to use corrupt influence with them. On 5 March 1860 John Covode (above) moved the appointment of a committee to inquire whether the President or any other official had attempted, by money, patronage, or other improper means, to influence legislation or the execution of the laws, etc. In spite of Democratic objection that only insinuations and no specific charges were made, the rules were suspended by 117 to 45, and the resolution adopted; an investigating committee of five was appointed, with Covode at the head. Buchanan sent in a message of protest 28 March, objecting on the ground that the President could only be indicted by impeachment, and that this was an indictment; and that such a method was inconsistent with the dignity of the office. The protest was declared unfounded by 88 to 40. On 16 June the committee reported, the Republican members declaring that the mass of evidence collected was proof of corrupt use of patronage, and Covode later alleged that they found also direct bribery, as evidenced by bank books. The Democratic members declared the allegations unsupported. No action was recommended to the House by the majority report, and none was taken. On 22 June Buchanan sent a second message protesting against the rejection of his first, and saying that on such views no man of honor and principle could accept the presidency. The House appointed another committee to report on this at the next session. Consult: Report of the Committee, Washington, 1860; Buchanan's 'Autobiography,' with his defense; Curtis, 'Life of Buchanan' (1883), for another defense.

Cow, the female of bovine animals, of which the male is called an ox (q.v.) or a bull. By a familiar process of extension the term has been applied to various other large herbivorous animals, such as the elephant, and even to female seals and whales.

Cowage. See COWITCH.

Cow'an, Frank, American lawyer and writer: b. Greensburg, Pa., 11 Dec. 1844. Making the tour of the world in 1880–1 and 1884–5, he entered Korea before that country had made treaties with other nations. He has written: 'Zomara, a Romance of Spain' (1873); 'The City of the Royal Palm and Other Poems' (1884); 'Fact and Fancy in New Zealand' (1885); 'Dictionary of Proverbial Phrases Relating to the Sea'; 'Australianisms.'

Cow'ard, William, English physician: d. about 1722. He was the author of 'Thoughts on the Human Soul; Demonstrating the Notion of the Human Soul United to the Human Body to be an Invention of the Heathens, and Not Consonant to the Principles of Philosophy or Reason.' This work excited considerable indignation among the more zealous divines, who procured an order to have it burned by the common hangman.

Cowbane, or **Water-hemlock** (*Cicutavirosa*), a perennial, umbelliferous, aquatic plant, producing an erect, hollow, much-branched, striated stem three or four feet high, furnished with

dissected leaves. It is highly poisonous. *C. maculata* is the spotted cowbane of the United States.

Cowberry, a common name for the single species (*C. palustre*) of the genus *Comarum*, of the rose family (*Rosaceæ*). It is known also as March cinquefoil and purple marshlocks. It is a stout green herb with very large and showy purple flowers. It grows in swamps and peat-bogs from Labrador to New Jersey, Iowa, British Columbia; also in Alaska and California. It is indigenous in Europe and Asia. It received the name of cowberry because it was thought, when rubbed on the milk-pan, to thicken the milk. The name is also applied to the cranberry (q.v.).

Cowbird, a bird (*Molothrus ater*) of the family *Icteridæ* (q.v.), abundant throughout North America except in the far north, and notorious because of its habit of escaping the drudgery of domestic cares after the fashion of the European cuckoo. Closely related to the bobolink or reed-bird (q.v.), the cowbird lacks the acute tail feathers and rich spring plumage of that species, while its general build and particularly its stout beak, are even more finch-like. The male is from seven and a half to eight inches long, and iridescent black with a brown head, and the female slightly smaller and nearly uniform dull brown. The cowbird takes its name from the habit of associating in flocks with cattle in the fields, apparently for the purpose of securing the flies which frequent the cattle, or the other insects which are disturbed by their movements. They are migratory and gregarious, never separating in pairs, but apparently quite promiscuous in their sexual relations. Nests are never built, but, like the European cuckoo, the eggs are stealthily introduced into the nests of other birds, preferably those of smaller size, such as warblers, finches, and vireos, of which a great many species are victimized. Apparently the cowbird exercises little choice, but drops its egg into any suitable nest that happens to be convenient; and, owing to its abundance, an astonishingly large number of nests are thus invaded. Some of the smaller warblers, notably the yellow warbler (*Dendroica æstiva*) and the redstart (*Setophaga ruticilla*), endeavor to circumvent the intruder by building a second story to the nest, enclosing between the two floors the egg of the cowbird, and even sacrificing one or more of their own. Nests with three cowbird's eggs thus enclosed in as many compartments have been found. Although but a single egg is deposited at a time, as many as three or four will sometimes be found in a single nest, in which cases they have probably been dropped by different females. The alien eggs hatch before those rightfully belonging to the nest, and, once the young cowbird has hatched, its demands for food so claim the attention of its foster-parents that the latter's own eggs or young are neglected and usually perish. Although chiefly insectivorous, berries and seeds are sometimes eaten by the cowbird.

In the warm parts of America a number of related species occur, which, having similar habits, are also known as cowbirds. A most remarkable relation exists between two South American species.

Molothrus badius, one of those in question, has the unusual habit of seizing and utilizing for the purpose of incubating its own eggs, the nests of weaker birds, whose eggs are destroyed. The second species (*M. rufoaxillaris*) is regularly and perhaps exclusively parasitic on the former.

Cowboys, in the American Revolution, a band of American Tories who infested the neutral ground of Westchester County, N. Y., robbed the Whigs and Loyalists, and made a specialty of stealing cattle. A similar band of marauders on the British side received the name of "Skinners." The word cowboys is now used to designate the men who have charge of the cattle on the vast ranges in the west and southwest of the United States. They are well mounted, and usually wear a fanciful costume. They are bold and adventurous, and necessarily have to encounter many dangers. A number of them were enlisted in two regiments of cavalry for the war with Spain, and, under the popular name of "Rough Riders," greatly distinguished themselves in the early part of the campaign against Santiago, in Cuba.

Cow-parsnip, or **Giant Parsley**, popular names for several species of the genus *Heracleum* of the natural order *Umbelliferæ*. They are coarse perennial herbs three to six feet tall, with large attractive leaves, for which the plants are valued in ornamental gardening, especially close to water and in wet soil. They should not be allowed to produce seed, because they are likely to become troublesome as weeds. Several of the species, of which there are about 60 widely distributed in temperate climates, are used as stock-feed, particularly in Europe, and have been suggested as desirable to plant for this purpose, because they produce an abundance of leaves very early in the spring. *H. panaces* is usually so recommended. It often attains heights exceeding eight feet and bears numerous leaves two or more feet long. Several species are natives of the United States and Canada, and one, *H. lanatum*, furnishes edible stems which in Alaska are called wild celery.

Cow-plant, a perennial genus of the natural order *Asclepiadaceæ*, milkweed family, which has acquired a celebrity from the repeated statement that its juice is used as milk, and that its leaves are boiled to supply the want of cream. This arises from the appearance of the juice, which is white and viscid, and contains the poisonous principles characteristic of the milkweed family. In parts of the United States cow-plant is a common name for the *Rhododendron maximum*.

Cow-pox. See VACCINATION.

Cow'-tree, a name given to a number of trees of different natural orders, the milky juice of which is used as a substitute for milk. A large tree (*Brosimum galactodendron*) belonging to the order *Artocarpeæ*, emits, when pierced, a highly nutritious milky juice with an agreeable creamy odor and taste recalling that of cow's milk, but which is slightly viscid, and soon becomes yellow, gradually thickening into a somewhat cheesy consistency. It grows on the Cordilleras of the coast of Caracas, where it is called *palo de vaca*, or *arbol de lêche*. The negroes and other lean natives of the region fatten on its milk. The cow-tree or hya-hya of Demerara is *Tabernæmontana utilis*, a tree belonging to the *Asclepiadaceæ*. In this order the

milky juice is usually acrid and poisonous, and even that of the other species of the same genus is of a sharp and burning taste. In this case, however, the juice is agreeable and wholesome, although somewhat sticky, owing to the large proportion of caoutchouc.

Cow'-wheat, the common name for the personated genus *Melampyrum*, of which there are several species, the most abundant being the common yellow cow-wheat, *M. pratense*.

Cow'ell, Edward Byles, English Sanskrit scholar: b. Ipswich, Suffolk, 23 Jan. 1826; d. Cambridge 9 Feb. 1903. He was educated at Oxford and was for some years principal of the Sanskrit College, Calcutta, but since 1867 had been professor of Sanskrit in Cambridge University, and was ranked as the foremost English Orientalist of his day. He published: 'The Prakrit Grammar of Varaaruci in Sanskrit and English' (1854); 'The Black Yajur Veda,' books 1–2 (with Roer) (1856–64); 'The Kaushítaki Upanishad, in Sanskrit and English' (1861); 'The Maitri Upanishad, in Sanskrit and English' (1863); 'The Kusumánjula, or Hindu Proof of the Existence of a Supreme Being, in Sanskrit and English' (1864); 'The Aphorisms of Sándilya,' translated from the Sanskrit (1878); 'The Sarva-darsána-samgrahá,' translated from the Sanskrit (with Gough) (1882); 'The Divyávandána' (with Neil) (1886); 'The Buddha-cáritá,' by Asvagosha, in Sanskrit and English (1892).

Cow'ell, John, English jurist: b. Ernsborough, Devonshire, 1554; d. Cambridge, England, 11 Oct. 1611. Educated at Eton and King's College, Cambridge, he soon distinguished himself in law, and in 1594 became regius professor of civil law in his university. In 1607 he offended the House of Commons by certain articles in his law dictionary, 'The Interpreter,' which asserted the absoluteness of the English monarchy, and James summoned him before his council. Ultimately his book was burned by the common hangman in 1610. Besides his dictionary he wrote 'Institutiones Juris Anglicani ad Methodum Institutionum Justiniani compositæ et digestæ' (1605).

Cow'en, Frederick Hymen, English musical composer and conductor: b. Kingston, Jamaica, 29 Jan. 1852. He was brought to England when very young, and studied music under Sir Julius Benedict and Sir John Goss. His cantata, 'The Rose Maiden,' produced in 1870, was followed in 1876 by another, 'The Corsair.' 'Pauline' (1876) is an opera, and 'The Deluge,' an oratorio. His other works include: 'Saint Ursula' (1881), a cantata; 'The Sleeping Beauty' (1885), also a cantata; 'Ruth' (1887), an oratorio; 'Song of Thanksgiving' (1888); 'St. John's Eve' (1889), a cantata; 'Thorgrim' (1890), an opera; 'The Water Lily' (1893), a cantata; 'Signa' (1893), an opera; 'Harold' (1895), an opera; 'The Transfiguration' (1895), a cantata; 'The Dream of Endymion' (1897); 'Ode to the Passions' (1898); 'Coronation Ode' (1902). He has also composed six symphonies, the chief being No. 3 (the Scandinavian), No. 4 (the Welsh), and No. 6 (the Idyllic.) Overtures, dances, suites, songs, and duets, pianoforte pieces, etc., make up the rest of his musical productions. In 1888 he conducted the concerts at the Melbourne Centennial Exhibition, and from 1888 till 1892 was conductor of the Philharmonic Society, and was re-elected in 1900. In 1896 he succeeded Sir Charles Hallé as conductor of the Manchester concerts, Liverpool Philharmonic Society, Bradford Festival Choral Society, etc.

Cowes, kowz, **West,** England, a seaport in Hampshire, on the north coast of the Isle of Wight, at the mouth of the river Medina. The public buildings include the castle, an old block fort of the time of Henry VIII., now used by the Royal Yacht Squadron as their club-house, the Royal London Yacht branch club-house, small town hall, several churches, good hotels, etc. Cowes is now principally known as a yachting port, and is considered the best place for building, fitting out, and laying up that class of vessels. Besides the building and repairing of yachts and other vessels, the industries include sail and rope making, etc. Cowes is the customs port for the Isle of Wight. The harbor, though small, is well sheltered and perfectly safe. The town is connected by railway with the principal places on the island, and there is good steamer service to Portsmouth and Southampton. The yachting season commences about the middle of May and extends to the beginning of November. Regattas are held annually. Cowes is much resorted to as a bathing-place. Pop. (1901) 8,654.

East Cowes, on the opposite side of the river, is connected with West Cowes by a steam ferry and floating bridge. This place is also given to yachting and all trades connected therewith. Osborne House (q.v.) is in the vicinity. Pop. 2,880.

Cowhage. See Cowitch.

Cowie, George, American naval officer: b. Scotland 1846; d. Rahway, N. J., 23 May 1902. He entered the navy as assistant engineer in 1864, took part in both attacks on Fort Fisher, and was honorably discharged with the thanks of the navy department 19 Dec. 1867. He subsequently served on the Mayflower and other vessels, and for his services in the destruction of Cervera's fleet during the Spanish-American war the President advanced him three numbers. He became a lieutenant-commander in March 1899, served in the Philippines for a short time, and was retired with the rank of captain 18 Aug. 1900.

Cowitch, Cowage, or **Cowhage,** a plant (*Mucuna pruriens*) belonging to the pea family (*Papilionaceæ*). It is a twining annual with large racemes of dark-colored flowers, which in India appear in the rainy season. The food, shaped like the letter S, is covered with delicate bristle-like spines, which are easily detached and, sticking in the skin, produce an intolerable itching. In India these spines are mixed with syrup and used as a vermifuge, the spines acting mechanically. When young the pods are cooked and eaten like string-beans. A plant of the same genus, growing in the West Indies, has the same characteristics. The negroes of the Southern States apply the name cowitch to the poison ivy (*Rhus toxicodendron*).

Cowl (Sax. *cugle;* Lat. *cucullus*), a sort of hood, originally worn by all classes, and still retained by certain orders of monks. It consists of a conical covering for the head, attached to the robe or cloak, and sometimes made to draw over the shoulders also. According to Mabillon,

it was at first the same as the scapular. The Benedictines and Bernardines have two sorts,—one black for ordinary occasions, and another white and very large for days of ceremony. The proper shape of the cowl has been the subject of long and bitter dissensions in the Franciscan order, which four popes exhausted every means to heal, and which were remedied only by time.

Cowles, William Lyman, American educator: b. Belchertown, Mass., 1856. He was educated at Amherst College, where he was instructor in Latin, 1880–3. Since 1894 he has been full professor of Latin there. He has published an annotated edition of 'Terence' (1896) and 'Selections from Catullus' (1900).

Cowley, kow'li, **Abraham,** English poet: b. London 1618; d. Chertsey, Surrey, 28 July 1667. He so early imbibed a taste for poetry that in 1633, while yet at school, he published a collection of verses, entitled 'Poetical Blossoms.' In 1637 he was elected a scholar of Trinity College, Cambridge, where he soon obtained great literary distinction, and published in 1638 a pastoral comedy, entitled 'Love's Riddle,' and another in Latin, called 'Naufragium Joculare,' acted before the university by the members of Trinity College. He was ejected from Cambridge as a royalist and removed to St. John's College, Oxford, where he published a satirical poem entitled the 'Puritan and the Papist.' He engaged actively in the royal cause, and when the queen was obliged to quit England Cowley accompanied her. In 1656 he returned to England, where he now published an edition of his poems, containing 'Miscellanies,' 'The Mistress,' 'Pindarique Odes,' and the never-finished epic, 'Davideis' (on the history of King David). He again visited France, and resumed his functions of agent in the royal cause on the death of Cromwell. On the Restoration he returned with the other royalists. By the interest of the Duke of Buckingham and the Earl of St. Albans he obtained the lease of a farm at Chertsey. In 1660 Cowley took part in founding the Royal Society; in 1661 he published a 'Proposition for the Advancement of Experimental Philosophy'; and a 'Discourse by Way of Vision Concerning the Government of Oliver Cromwell,' which is pronounced by Bishop Hurd one of the best of the author's prose works. He published two books of a Latin poem on plants in 1662; he afterward added four more books, and the whole, together with other pieces, was published in 1678 under the title of 'Poemata Latina.' A poem on the 'Civil War' appeared in 1679; his 'Select Works,' with preface and notes by Bishop Hurd, were published in 1772–7.

Cowley was extremely popular in his day, and his style, both in prose and verse, has been highly commended by critics; but his poems have failed to maintain their ancient popularity. The wit for which they were once celebrated has become obsolete, and he is now little read; but Charles Lamb speaks highly of him as a poet, and Hazlitt as a prose writer.

Cowpea (*Vigna cat-jang*). It belongs to the natural order *Leguminosæ*, and is native of southeastern Asia, the Malay Archipelago, and central Africa. It was introduced into the United States in the 18th century, and is most largely grown in the southern States, where it is known as the cornfield or black-eye pea. Its habits of growth vary from a bush type in the northern States to a vine where it has a longer period of growth. Numerous varieties are on the market. Whippoorwill, Black, Clay, and Unknown are favorites. They are often grown on poor soils, but such should be enriched either with barnyard manure or phosphatic fertilizers. The seed is sown broadcast or drilled, at the rate of from one half to one and a half bushels per acre.

Uses and Feeding Value.—It is growth for food, hay, silage, soiling, grazing, and soil renovation; having marked powers of enriching the soil in nitrogen like clover (q.v.). Its average percentage composition is:

	Protein	Nitrogen-free Extract	Ether Extract	Crude Fibre	Ash	Water
Cowpea green	2.4	7.1	0.4	4.8	1.7	83.6
Cowpea vine silage	2.7	7.6	1.5	6.0	2.9	79.3
Cowpea hay	16.6	42.2	2.2	20.1	7.5	10.7
Cowpea seed	20.8	55.7	1.4	4.1	3.2	14.8

The average digestibility per cent is:

	Protein	Nitrogen-free Extract	Ether Extract	Crude Fibre	Dry Matter
Cowpea green	74	84	50	57	76
Cowpea vine silage	57	72	63	52	68
Cowpea hay	65	71	50	43	59

Cowpea seeds are eaten by man, either green, shelled, and cooked like garden peas or shell-beans, or dried for winter use. They are occasionally fed to stock. Some find difficulty in curing cowpea hay satisfactorily, but this is overcome with experience. The silage is somewhat similar to the green crop in composition. When used for soiling the amount consumed and time of feeding can be regulated, thus avoiding bloating, which is liable to occur when pasturing. Sheep are usually turned on the pasture before the plants are in bloom, cattle about the time the plants come into bloom; while for swine the peas are allowed to reach full size. The plants are sometimes cut down by the cowpea wilt. The September brood of the boll-worm and the weevil (*Bruchis chinensis*) also give trouble to the plants. Consult: Smith, 'Cowpeas'; Farmers' Bulletin No. 89, United States Department of Agriculture.

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Cow'pens, S. C., a post village in Spartanburg district, near the border of North Carolina, near which a signal victory was gained by the American forces, commanded by Gen. Daniel Morgan, over a British division under Col. Tarleton, 17 Jan. 1781.

Cowpens, Battle of, in the American Revolution, 17 Jan. 1781. At the end of 1780 Cornwallis held South Carolina with a little over 3,000 men, having lost 1,100 with Ferguson two months before, at King's Mountain. Waiting for reinforcements, he lay at Winnsborough, north of the centre, within supporting distance of Fort Motte and Orangeburg in the centre, Charleston and Georgetown on the coast, and Augusta and Ninety-Six in the west. In December Greene came down with only 2,000 men, but with a wonderful group of subordinate leaders fit for separate commands. With 1,100 men he

occupied Cheraw Hill in the northeast, and kept Cornwallis in alarm for his communications with the coast; 900 under Daniel Morgan, part militia, part regulars, he sent west to join hands with the victors of King's Mountain if possible, and alarm Cornwallis for the western posts. Cornwallis moved north into North Carolina to force a like movement on Greene, and sent Tarleton after Morgan. The latter took post in a pasture ground called the Cowpens, near the northern boundary, a few miles southwest of King's Mountain, and just west of Broad River. A long slope led up to a low rise; then came a depression, succeeded 150 yards farther on by another rise; and in rear of this was the river, cutting off retreat. This move of Morgan's was in violation of all military rules, but he was a man of genius and used to militia; he said that he could ask but one thing better, and that was to have them entirely surrounded by the enemy, so they could not run — the river was cheaper than regulars to shoot them down. Tarleton came in sight on the morning of 17 Jan. 1781, and Morgan placed his militia 150 yards in front of the first hill, with injunctions to fire at least two volleys at close range before breaking; on the hill, the famous First Maryland regulars, with some fine Virginians; on the second hill, his cavalry under Col. William Washington, a second cousin of George. As the British closed, the militia did not break; they were under Col. Andrew Pickens, and fired many more than the two volleys, with destructive effect. Finally forced back, they retired to the left around the hills to the river bank, in rear of the cavalry, to re-form. The British left stretched around to flank the right of the American regulars, who drew back to face them; the British thought them retreating, and hurried forward in some disorder. Just then Col. Washington's cavalry charged around the two hills to the left, coming up to the militia's old position and taking the British in rear, with the river on their flank; the militia rushed around the hills to the right, taking them in flank on the left; and the Continental regulars, only 30 yards off, poured in a withering fire and charged bayonet. Hannibal himself never wrought out a finer piece of tactics, or caught an enemy in a deadlier trap. Most of the British troops threw down their arms; the remnant fled with Tarleton, who barely escaped being cut down by Col. Washington's sabre. Of the 1,100, 270 were killed and wounded, and 600 taken prisoners, with two field-pieces and 1,000 small arms. The Americans lost 12 killed and 62 wounded. Nearly a third of Cornwallis' army, including all his light troops, were annihilated at a blow.

Cowper, kow'pėr or koo'pėr, **Edward,** English inventor and improver of machinery: b. 1790; d. London 17 Oct. 1852. During the greater part of his life he was a printer, and some of the most important improvements in machine printing are due to him. Among others may be mentioned the giving a diagonal action to the rollers on the self-acting inking tables. During the latter part of his life he was professor of mechanics and manufacturing arts at King's College. He wrote an elaborate article on a 'Button,' and delivered lectures on the London crystal palace in 1851.

Cowper, William, English poet: b. Great Berkhampstead, Hertfordshire, 15 Nov. 1731; d. East Dereham, Norfolk, 25 April 1800. He lost his mother at the age of 6, and at 10 was sent to Westminster School, which he left at 18 with a fair reputation for classical learning, and a horror of its discipline, which he afterward expressed in his 'Tirocinium.' He was then articled for three years to a solicitor. At the expiration of his apprenticeship he took chambers in the Middle Temple, and in 1754 was called to the bar. It was at the close of his residence in the Temple, in 1763, that the first crisis of his malady occurred. Cowper's family was possessed of considerable influence, and it had been the intention of his family in bringing him up to the law to secure him an appointment in the House of Lords. In this year several clerkships fell vacant, which were supposed to be at the disposal of his cousin. Two of them were conferred on him, the duties of which required him to appear before the house. These his nervousness induced him to relinquish, and accept that of clerk of the journals, which did not entail any public duty. Unfortunately his cousin's right to make this presentation was questioned, and it became necessary that he should submit to an examination at the bar of the house. He was now in a mortal dilemma. Many motives, among which the chief was the honor of his friend, made him feel it an imperative duty to answer the citation; but the more inevitable the necessity of his public appearance seemed, the higher rose his horror of undertaking it. He even looked forward as a relief to the approach of insanity, and finding it too slow he attempted suicide; but this too failed, and on the very day appointed for the examination he resigned the office, and soon after became insane. From December 1763 to June 1765 he remained under the care of a physician. The form assumed by his malady was that of religious doubt and despondency. The Calvinistic views he had adopted in regard to election, and his own powerful and susceptible imagination, made these doubts assume the most dreadful form. He was continually haunted with the belief that he had sinned beyond forgiveness, and that eternal misery of the most aggravated kind was ready to overtake him. On his recovery he settled at Huntingdon, and made the acquaintance of the Rev. Mr. and Mrs. Unwin, with whom he became a boarder, and whose kindness had the most soothing and beneficial influence on him. On the death of Mr. Unwin in 1767 he removed with Mrs. Unwin to Olney, the residence of the Rev. John Newton, who also became an intimate friend and exercised a powerful influence over his mind and conduct. A constant devotion to religious duties was the characteristic of the evangelical school to which Mr. Newton belonged, and to which Cowper endeavored to conform. Newton had resolved on publishing a volume of hymns, and secured the co-operation of Cowper in composing them, but before their publication in 1776 he had been again attacked by his constitutional malady, by which for 10 years from 1773 his mind, with occasional intervals of recovery, was continually clouded. In 1776 he commenced a poem on the 'Progress of Error,' followed by three other poems, 'Truth,' 'Table-talk,' and 'Expostulation'; these with some others were published in a volume in 1782. Lady Austen then suggested the 'Task,' which, together with 'Tirocinium,' formed a second volume in 1785. The 'History

of John Gilpin' is also due to the suggestion of Lady Austen. The translation of Homer, begun in 1784, occupied him for the next six years, and was published in 1791. He removed during its progress, in 1786, from Olney to Weston. In the beginning of 1794 he was again attacked with madness, which was aggravated by the death of Mrs. Unwin in 1796. During intervals of relief he revised his Homer, and composed some short pieces. The 'Task' unites minute accuracy with great elegance and picturesque beauty; and after Thomson, Cowper is probably the poet who has added most to the stock of natural imagery. The moral reflections in this poem are also exceedingly impressive, and its delineation of character abounds in genuine nature. His religious system, too, although discoverable, is more cheerfully exhibited in this than in his other productions. His version of Homer possesses much exactness as to sense, and is certainly a more accurate representation of Homer than the version of Pope; but English blank-verse cannot sufficiently sustain the less poetical parts of Homer, and the general effect is bald and prosaic. As a letter-writer Cowper is unsurpassed for ease, gaiety, and naturalness. An excellent edition of his works, with memoir, is that of Southey; the Aldine and Globe editions are also to be commended. Consult 'Lives' by Smith (1880); Wright (1892).

Cowper's Glands, two glands discovered by an English anatomist, William Cowper, situated in male mammals behind the anterior portion of the membrane of the urethra. They secrete mucus and are active in the generative function, corresponding to Bartholini's glands (q.v.) in the female.

Cow'rie, resins from New Zealand, derived from *Dammara australis,* and in New Caledonia commonly from the *D. ovata.* Most of the resin is found embedded in the earth in cowrie fields, located in the northern islands.

Cowry, a mollusk of the genus *Cypræa,* a gastropod, comprising nearly 200 species with beautifully colored shells. The cowries are mostly confined to the tropics, especially of the Old World, none occurring on the coast of South America. They live in reefs and under rocks at low water and feed on various polyps. The money cowry is *Cypræa moneta.* See WAMPUM.

Cow'slip, a popular name for several distinct species of plants, both American and European. The English cowslip is *Primula officinalis,* of the natural order *Primulaceæ.* It is a stemless perennial herb with a rosette of oval or oblong soft leaves, from among which arise numerous scapes 6 to 10 inches tall and bearing 6 or 8 bright yellow fragrant flowers in a close umbel which leans to one side. The plant has long been a general favorite in gardens where it usually receives little attention beyond an occasional stirring of the soil to remove weeds and the application of the usual winter mulch of stable manure. Several improved varieties have been produced in divers colors. The plant most widely known in America as cowslip is *Caltha palustris,* the marsh marigold, a member of the natural order *Ranunculaceæ.* This is a succulent perennial herb common in wet ground from the Carolinas to the Arctic regions. It has strong fibrous roots, hollow branching stems one to two feet tall, heart-shaped or kidney-shaped leaves, and brilliant yellow flowers resembling buttercup, by which name the plant is sometimes called. It is often cultivated for ornament in marshy ground and has developed some improved double-flowered varieties. Its leaves and young stems are often used as a pot-herb in early spring. The American cowslip or shooting-star is *Dodecatheon Meadia* of the natural order *Primulaceæ.* It is a stemless perennial with fibrous roots, spatulate-oblong leaves in a dense rosette from which the scape rises to a height of 9 to 18 inches or more bearing at its summit several or many pendant pink, white, or lilac flowers with reflexed petals and prominent anthers and pistils. Each flower of the cluster resembles the solitary flowers of cyclamen. Other species of the same genus are also known by the name, and like it are planted in hardy flower borders like the English cowslip. The Virginia cowslip is *Mertensia virginica* (or *M. pulmonarioides*), which belongs to the natural order *Boraginaceæ.* It is also known as blue bell and Virginia lungwort, and is a perennial herb one to two feet tall, and bears pendulous clusters of blue bell-shaped flowers. The plant does best in a sunny situation sheltered from the wind, and a rich loamy soil. In such surroundings it will continue floriferous for years, hence is an admirable plant for rockeries. Propagation is effected by means of seeds and sometimes by division of the plants.

Cox, David, English landscape painter; b. Birmingham 29 April 1783; d. Harborne, near Birmingham, 7 June 1859. He was for several years engaged as scene-painter for various provincial and London theatres, and during a considerable portion of his early life he had to teach his art for a subsistence. After residing in London, Hereford, and elsewhere, he went to Birmingham in 1841. His works are chiefly of English landscape, and in water colors, in which he especially excelled, being ranked by some critics as the first of English water colorists. In later life he painted a good deal in oil. Well-known pictures by him are 'Washing Day' (1843); 'The Vale of Clwyd' (1846); 'Peace and War' (1846); 'The Summit of the Mountain' (1853). He published a work on 'Landscape-painting and Effect in Water-colors' (1814). His son, David Cox (1809–85), was likewise a water-colorist of some distinction.

Cox, Sir George William, English clergyman and historical writer; b. Benares, Hindustan, 10 Jan. 1827; d. Walmer, England, 9 Feb. 1902. He was educated at Rugby and Trinity College, Oxford, and took orders in 1850. From 1850 till 1851 he was curate of Salcombe Regis, Devon; from 1854 till 1857, of St. Paul's, Exeter, and in 1881 became vicar of Bekesborne, Kent. From 1881 till 1897 he was rector of Scrayingham, Yorkshire. He succeeded his uncle in the baronetcy in 1877. He published 'Poems Legendary and Historical' (with the historian Freeman, 1850); 'Life of St. Boniface' (1853); 'Tales from Greek Mythology' (1861); 'The Tale of the Great Persian War, from Herodotus' (1861); 'Tales of the Gods and Heroes' (1862); 'Tales of Thebes and Argos' (1864); 'A Manual of Mythology' (1867); 'Tales of Ancient Greece' (1868); 'The Mythology of the



Photograph by J. Horace McFarland Co.

COWSLIP.

Aryan Nations' (1870); 'Latin and Teutonic Christendom' (1870); 'History of Greece' (1874); 'The Crusades' (1874); 'The Greeks and Persians' (1876); 'The Athenian Empire' (1876); 'A General History of Greece' (1876); 'History of the Establishment of British Rule in India' (1881); 'Introduction to Science of Comparative Mythology and Folk Lore' (1881); 'Short Historical Anecdotes' (1882); 'Lives of Greek Statesmen' (1885–6); 'Concise History of England and the English People' (1886); 'Life of John William Colenso. Bishop of Natal,' perhaps his most important work (1888); 'The Church of England and the Teaching of Bishop Colenso' (1888).

Cox, Jacob Dolson, American soldier: b. Montreal 27 Oct. 1828; d. Magnolia, Mass, 4 Aug. 1900. He was graduated at Cambridge in 1844, becoming a lawyer; but upon the outbreak of the Civil War was made brigadier-general of Ohio Volunteers. In 1862 he became Major-General of the United States Volunteers, and in 1864 commanded a division at Nashville. He was elected governor of Ohio in 1865, and in 1869 became Secretary of the Interior in President Grant's cabinet.

Cox, John, Canadian educator: b. London, England, 1851. He was graduated at Cambridge in 1874, becoming a Fellow of Trinity, and in 1887 Warden of Cavendish College, Cambridge. He entered the University Extension movement, and in 1889 went to Canada, becoming professor of physics in McGill University, a post he has since retained.

Cox, Kenyon, American painter: b. Warren, Ohio, 27 Oct. 1856. He is a son of J. D. Cox (q.v.). After studying in Paris under Duran and Gerome, he settled in New York in 1883 as a portrait and figure artist. Among important pictures by him are 'Jacob Wrestling with the Angel'; 'Vision of Moonrise'; 'Painting and Poetry'; 'Flying Shadows.' As an illustrator also he takes high rank, his designs for Rosetti's 'Blessed Damozel' being well known, and he has written many able art criticisms and reviews. He is a member of the Society of American Artists, and of the Architectural League, New York.

Cox, Louise Howland King, American artist: b. San Francisco, Cal., 1865. She is a pupil of the National Academy of Design, and of Kenyon Cox (q.v.), whom she married 30 June 1892. In 1896 she won the 3rd Hallgarten prize of the National Academy of Design, and in 1900 was awarded a bronze medal at the Paris Exposition.

Cox, Millard F., "Henry Scott Clark," American lawyer and writer: b. Noblesville, Ind., 25 Feb. 1856. He was admitted to the bar in 1880; was assistant reporter of the Indiana Supreme Court 1885–9, and judge of the Indianapolis criminal court 1890–4. In 1899 he published, under the pen name of "Henry Scott Clark," 'The Legionaries; a Story of the Great Raid.'

Cox, Palmer, American artist and writer for young people: b. Granby, Quebec, 28 April 1840. Since 1875 his home has been in New York. His works are both written and illustrated by himself. He is best known by his 'Brownie Books,' a very popular series containing humorous pictures and verse for children. Other productions are: 'Hans Von Petter's Trip to Gotham' (1878); 'How Columbus Found America' (1878); 'Queer People' (1888); etc.

Cox, Samuel Hanson, American Presbyterian clergyman: b. Rahway, N. J., 25 Aug. 1793; d. Bronxville, Westchester County, N. Y., 2 Oct. 1881. He began the study of law, but abandoned it for theology, was ordained by the New Jersey presbytery 1 July 1817, and became pastor of the Spring Street Presbyterian Church in New York in 1820. He took a prominent part in the anti-slavery agitation; was pastor of the First Presbyterian Church, Brooklyn, N. Y., 1837–54, and during a considerable part of the time was also professor of ecclesiastical history in Union Theological Seminary. He was a prominent member of the New School branch of Presbyterianism, and several times represented it at European gatherings. The last 20 years of his life were spent chiefly in retirement. He published 'Quakerism not Christianity' (1833); 'Interviews, Memorable and Useful, from Diary and Memory Reproduced' (1853); and edited Bower's 'History of the Popes' (1847).

Cox, Samuel Sullivan, American statesman and author: b. Zanesville, Ohio, 30 Sept. 1824; d. New York 10 Sept 1889. He was a Democratic member of Congress from Ohio 1857–65; and from New York 1869–85, and 1886–9. He was also for a short time minister to Turkey. He was a popular lecturer and published 'Eight Years in Congress' (1865); 'Why We Laugh' (1876); 'Diversions of a Diplomat in Turkey' (1887); 'A Buckeye Abroad'; 'Arctic Sunbeams'; 'Orient Sunbeams'; 'Search for Winter Sunbeams'; 'Free Land and Free Trade'; etc.

Coxal'gia, or **Coxitis.** See Coccygodynia.

Coxcie, kŏk'sē, or **Cocxie, Michael,** Flemish painter and engraver: b. Mechlin 1497; d. there 10 March 1592. He was a pupil of Bernard van Orley, and traveled to Rome, where he remained several years, attracted by the works of Raphael, with whom he was probably personally acquainted. Here he executed several paintings in fresco, and many other pieces. He also painted the 'History of Cupid and Psyche,' in the style of Raphael, which was engraved on 32 copper-plates. In the Imperial Gallery of Vienna we find a Madonna with the Infant Jesus by him. His works are rare, even in the Netherlands.

Coxe, Arthur Cleveland, American Protestant Episcopal prelate, and author: b. Mendham, N. J., 10 May 1818; d. Clifton Springs, N. Y., 20 July 1896. He was a son of S. H. Cox (q.v.), but adopted an older spelling of his surname. He took orders in the Episcopal Church in 1841; and after holding rectorships at Hartford, Conn., Baltimore, Md., and New York was consecrated Bishop of Western New York in 1865. He was a vigorous, powerful prose writer, and his 'Christian Ballads' (1840) was long popular. His other works include 'Athanasion and Other Poems' (1842); 'Saul, a Mystery, and Other Poems' (1845); 'Thoughts on the Services'; 'Impressions of England' (1865); 'The Criterion' (1866);

'Apolos, or the Way of God' (1873); 'Institutes of Christian History' (1887); 'The Pascal,' a collection of Eastern poems (1889); etc.

Coxe, kŏks, Reginald Cleveland, American marine artist: b. Baltimore, Md., 21 July 1855. He is the son of A. C. Coxe (q.v.). He studied under Bonnat in Paris, has been a member of the Society of American Artists from 1888, and is also a member of the Architectural League, New York. His sea pictures have been much admired, and he is also an etcher of note.

Coxe, Tench, American economist: b. Philadelphia, Pa., 22 May 1755; d. there 17 July 1824. At first a Royalist he became a Whig, was a member of the Annapolis Convention 1786; the Continental Congress 1788; assistant secretary of the treasury 1790; commissioner of the revenue 1792–7; and purveyor of public supplies 1803–12. He early devoted much attention to political economy, and his writings and ideas on this subject constitute his chief claim to remembrance. He favored the prohibition of the coasting trade to foreign shipping; the importation of foreign goods only in ships of the country producing them; the special encouragement of manufactures; and the exemption of raw materials from tariff duties. He urged the South to take up cotton-raising, is sometimes called the father of the American cotton industry, and is said to have been the first to attempt to bring an Arkwright machine to the United States. His publications are: 'Inquiry into the Principles on Which a Commercial System for the United States Should be Founded' (1787); 'Examination of Lord Sheffield's Observations on the Commerce of the American States' (1792); 'View of the United States of America' (1794); 'Thoughts on Naval Power and the Encouragement of Commerce' (1806); 'Memoir on Cultivation, Trade, and Manufacture of Cotton' (1809); 'Statement of the Arts and Manufactures of the United States for the Year 1810' (1814), the first extended attempt to make an industrial census of the country.

Coxe, William, English historian and traveler: b. London 7 March 1747; d. Bemerton, Wiltshire, 16 June 1828. He published an account of his travels through Switzerland (1779), and through Poland, Russia, Sweden, and Denmark (1784–92), which have been translated into almost all the languages of Europe. As historian he brought himself into notice by his 'Memoirs of Sir Robert Walpole' (1798), followed by those of Horatio, Lord Walpole (1802). He then published his 'History of the House of Austria' (1807); afterward 'Memoirs of the Kings of Spain of the House of Bourbon, from 1700 to 1788' (1813).

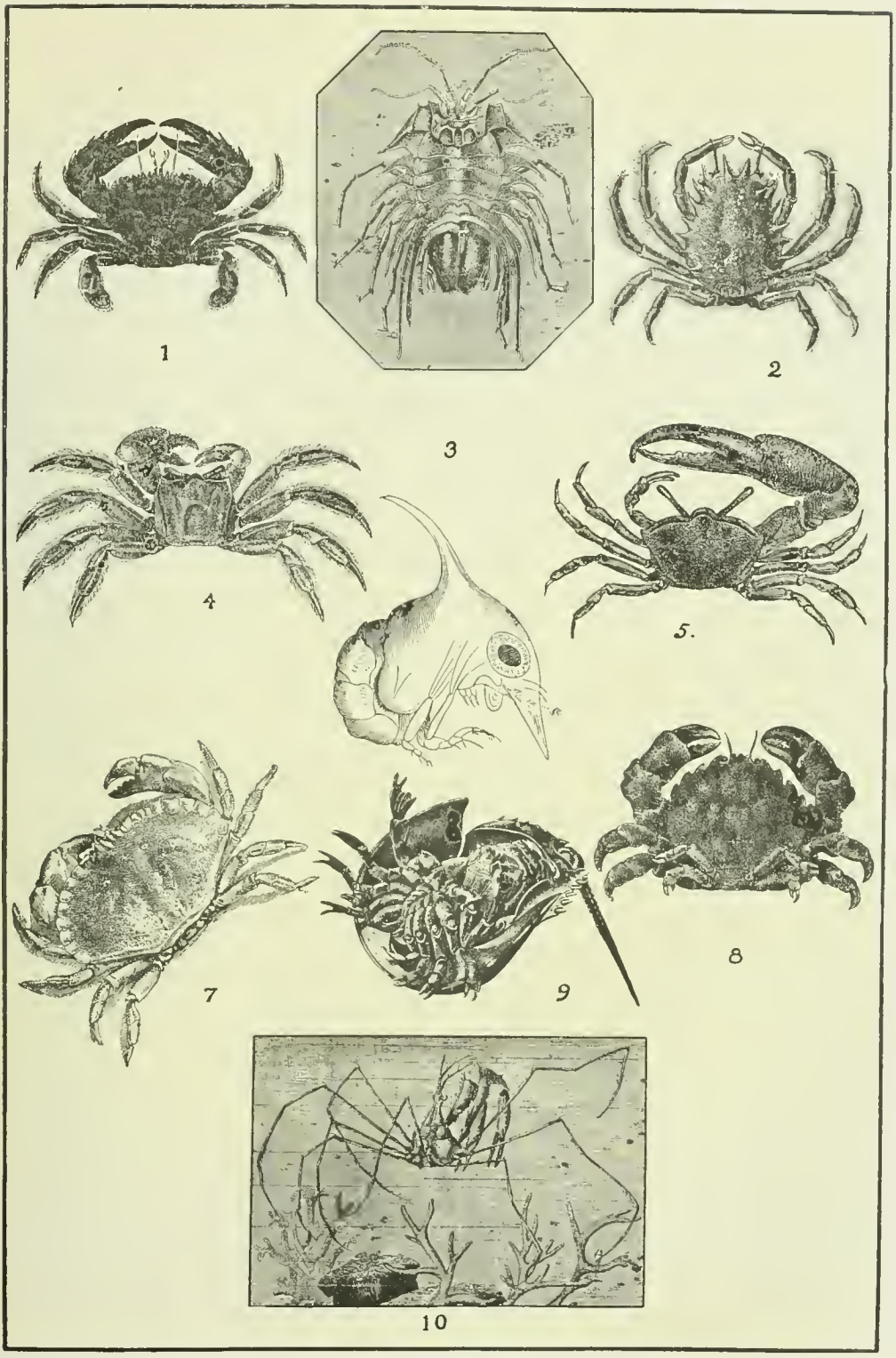
Coxeyites, the followers of Jacob S. Coxey of Massillon, Ohio, who, during the financial depression existing in the United States in November 1893 announced that he intended to lead an army of 100,000 of unemployed people to Washington, to petition Congress for the issuance of $500,000,000 in non-interest bearing bonds, to be used for the improvement of roads. Coxey left Massillon on 25 March 1894, at the head of 122 people, and reached Washington 1 May. In the attempt to make a speech from the capitol steps, he was accused of stepping on the grass, and with one Carl Browne, was imprisoned for 20 days. The starting of several "commonweal" companies, or Coxey contingents, denominated "armies," for Washington in the early part of 1894, demonstrated how widespread was the condition of idleness.

Coxwell, Henry Tracey, English aeronaut: b. Wouldham, near Rochester, 2 March 1819. From boyhood he took a keen interest in ballooning; in 1844 became a professional aeronaut, and in 1845 established the "Aërostatic Magazine." After that he made some 700 ascents, the most remarkable being that of 1862, when he reached a height of seven miles. He published 'My Life and Ballooning Adventures' (1887–8).

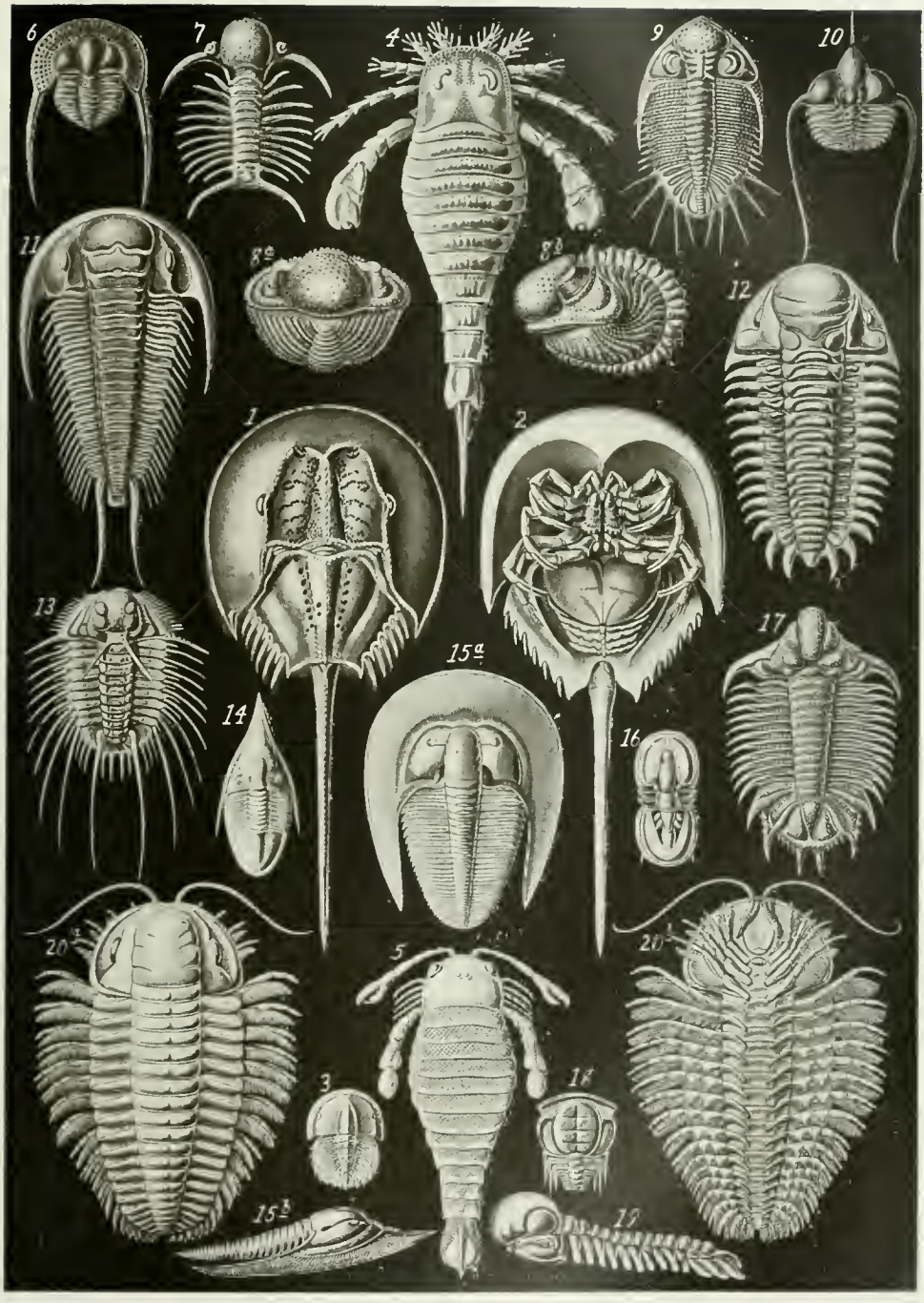
Coyle, John Patterson, American Congregational clergyman: b. East Waterford, Pa., 3 May 1852; d. Denver, Colo., 21 Feb. 1895. He was graduated from Princeton College in 1875 and was instructor in Latin there 1877–9. He subsequently entered the ministry and from 1882 to 1895 was pastor of Congregational churches in Ludlow, Mass., New York, North Adams, Mass., and Denver. He was the author of: 'The Spirit in Literature and Life' (1895); 'The Imperial Christ' (1896).

Coyote, kī'ō-tē, the prairie wolf (*Canis latrans*), native to the western United States, and before the advent of civilization numerous as far east as the extent of the prairies of the Mississippi valley, where it was called the red wolf in distinction from the large gray or timber wolf (q.v.). At present it is abundant from the dry plains of Texas, Nebraska, and Manitoba, westward to the Pacific coast, south of central British Columbia, and also in Mexico. Throughout this wide range it supports itself easily in spite of civilization, and at night its long-drawn cry, more like a bark than a howl, may be heard for long distances; and, owing to its predatory habits, this wailing call inspires terror in its possible victims and rouses the anger of the western ranchman whose flocks and herds are apt to suffer from the inroads of the barking wolf, as the coyote is sometimes called.

Coyotes are smaller than other wolves, being about the size of setter dogs, and, although they often travel in packs, as do other wolves, they are cowardly where man is concerned, and confine their raids to the brute creation. Their fur is soft, reddish or tawny-grey in color, sometimes slightly tipped with black. The tail is bushy, the ears upright, and the slender muzzle very pointed. The coyotes live in hollows among rocks, or in deserted burrows, whence they usually issue at dusk, to hunt. Their food is chiefly gophers, mice, ground-nesting birds, prairie-dogs, and other small animals, their depredations on sheep-folds and cattle-ranches being mainly reserved for winter. In former days they were persistent enemies of the pronghorns. They are fleet footed, cunning in avoiding snares, and adapt themselves readily to varying conditions,—hence they increase rather than diminish in the more isolated regions where they are found. They were well known to the western Indians and formed the basis of some breeds of their dogs. Many tales of American Indian folk-lore in these tribes are concerned with them. Consult Wolf; and consult: Elliot, 'Synopsis of Mammals' (1901); Ingersoll, 'Wild Neighbors' (1897).



1. The Bow Crab (Thalamita natator).
2. The Thornback Crab.
3. Serolis Bromleyana.
4. The Sand or Horseman Crab (Ocypoda).
5. The Fiddler Crab (Gelasimus pugilator).
6. A Crab at an early (zoea) stage of growth.
7. European Edible Crab.
8. The Sponge Crab (Dromia vulgaris).
9. The Horseshoe Crab (Xiphosurus).
10. The Spider Crab (Stenorhynchus longirostris)



TRILOBITES AND KING CRABS.

1–3 Limulus moluccanus. King Crab–upper–lower views are larvs. 4 Eurypterus Fischeri. 5 Pterygotus Anglicus.
6–21 Trilobites of various forms.

Coypel, kwä-pĕl, **Noël,** French painter: b. 25 Dec. 1628; d. Paris 24 Dec. 1707. After he had embellished, by the royal command, the old Louvre with his paintings (from the cartoons of Lebrun), and had in like manner adorned the Tuileries, he was appointed a director of the French Academy in Rome. His four pictures for the Council Hall at Versailles — Solon, Trajan, Severus, and Ptolemy Philadelphus — excited the admiration of connoisseurs. His chief works are the 'Martyrdom of St. James' (in the church of Notre Dame), 'Cain Murdering His Brother' (in the Academy), the 'Trinity and the Conception of the Holy Virgin' (in the Hotel des Invalides). Coypel had a rich imagination, drew correctly, understood expression, and was an agreeable colorist.

Coypu, koi-poo′, or **Nutria,** an aquatic rodent (*Myopotamus coypu*), native to South America. It is known colloquially as the nutria, or otter, in the countries where it is found, and its pelt furnishes the fur known commercially as "otter." It is not an otter, but is related to the beaver. It is dull brown, has a gray muzzle, and red incisors. Its nostrils are so set that it can breathe when all immersed except the tip of its nose. It is somewhat smaller than the beaver, and has a slender, rat-like tail. It is distinctly aquatic, dwelling in ponds, and burrowing into the banks, or building platform-nests among the reeds on the shore. Owing to the threatened extermination of the coypu local laws have been enacted for its protection as a valuable fur-bearing animal, and it has been saved by these and by a smaller demand for its pelt. Its call is like the moan of a human creature in pain; and when a female and her family of eight or nine take to the water they become very noisy, as well as playful. Consult: Hudson, 'The Naturalist on the La Plata' (1892). See BEAVER.

Coysevox, Antoine, äṅ twäṅ kwäs-vŏks, French sculptor: b. Lyons 29 Sept. 1640; d. Paris 10 Oct. 1720. Among his best works are an equestrian statue of Louis XIV.; the statue of Cardinal Mazarin; the tomb of Colbert; the group of 'Castor and Pollux'; the 'Sitting Venus'; the 'Nymph of the Shell'; the 'Hamadryad'; the 'Faun with the Flute'; 'Pegasus and Mercury.'

Coyuvos, kō-yoo′vōz, natives of the Cuyos islands, Philippines. They are of Tagbanua stock and speak the Tagbanua language. They are Christians.

Cozens, John Robert, English water-color painter: b. 1752; d. 1799. He was instructed by his father, Alexander Cozens. In 1776 he visited Switzerland, with Payne Knight, and in 1783 returned from an extended tour in Italy with William Beckford, who commissioned many of the washed drawings which he then executed. Among his English subjects are some fine studies of trees made in Windsor Forest. The date of his death has been usually stated as 1799, but there is reason to believe that he was alive after 1801.

Cozumel, kō-soo-māl′, an island in the Caribbean Sea, off the coast of Yucatan in lat. 20° 34′ N.; lon. 86° 44′ W. It is 30 miles long, by about 8 miles broad, and is low and covered with trees. It is fertile, and abounds in fruit and cattle. Numerous interesting remains of ancient buildings have been discovered on it. When visited in 1518 by Juan de Grijalva it contained a numerous population, and was much resorted to as a place of peculiar sanctity by the Indians of the neighboring continent.

Cozzens, kŭz′ĕnz, **Frederick Swartwout,** American humorist: b. New York 5 March 1818; d. Brooklyn, N. Y., 23 Dec. 1869. He was a wine merchant, to whom literature was a recreation. In 'Yankee Doodle' (1847) were published his earliest humorous poems and sketches. In 1853 a volume entitled 'Prismatics' was published under the pen-name of "Richard Haywarde"; and in 1856 the 'Sparrow-grass Papers,' which attained great popularity.

Crab, the name applied to any of the brachyurous or short-tailed decapod crustacea, comprising numerous forms, which, with the exception of a very few fresh-water species, are inhabitants of the ocean. In the crabs the abdomen is folded under the chest (cephalothorax), while the antennæ are short and small. The group includes among others the spider-crabs (*Hyas, Libinia,* etc.), which have a somewhat spherical body with long sprawling legs. The shore-crabs are represented by the species *Cancer,* which are among the largest of the order. They have a broad shell or carapace, without a prominent beak, or rostrum. There are nine gills on each side. Of the two species on the New England and Canadian coast, *C. irroratus* is the more common, and often used for food, and *C. borealis* is less abundant. A fossil species (*C. proavitus*) has been detected by Packard in a collection from the Miocene Tertiary green-sand beds of Gay Head, Martha's Vineyard. It appears to have been the source from which the two existing species arose by divergent evolution. Allied to Cancer is the mud-crab (*Panopæus*).

The soft-shelled crab of the markets is *Callinectes sapidus;* it is so called from being captured soon after molting, when its shell is still soft. The fiddler-crabs (*Gelasimus*) so abundant on our shores, dig holes near high-tide mark, closing the entrance with their larger claw. The oyster-crab is soft-shelled from living within the shell of bivalves (see COMMENSALISM). The land-crabs of the tropics live away from the sea, only going to it to lay their eggs in the water during the spawning season. See also CRUSTACEA; HERMIT-CRAB; PALM OR ROBBER-CRAB; and the various groups and species above mentioned.

Crab, in ship-building, a wooden pillar, with its lower end let down through a ship's decks, resting upon a socket like the capstan. It is employed to wind in the cable or to raise any weighty matter. It differs from the capstan by having no drum-head, and by having the bars going entirely through it. The same name is given to a portable wooden or cast-iron machine fitted with wheels and pinions similar to those of a winch, of use in loading and discharging timber vessels, etc.

Crab-apple, a plant of the genus *Pyrus-malus,* belonging to the apple family (*Pomaceæ*). The genus comprises about 15 species, natives of the temperate zone of the northern hemisphere. The term crab-apple is applied rather vaguely to any sour or uncultivated species of the apple family, but strictly it belongs

to the wild-growing varieties of the true apple, which is produced from the crab-apple by cultivation. The species best known in America is the narrow-leaved crab-apple, which is a small tree, reaching 20 feet in height, with a diameter of 10 inches. It grows in thickets from New Jersey to Illinois and Kansas, and south to Florida and Louisiana. The American crab-apple grows to the height of 25 feet, and has a diameter of 12 inches. The wood is soft, and of a reddish-brown color. In both trees the wood weighs about 44 pounds to the cubic foot. The American crab-apple grows from Ontario west to Michigan, and as far south as South Carolina. Its fruit is about one and a quarter inches in diameter, greenish-yellow, very fragrant, and externally acid. This tree is known also as the sweet-scented crab-apple. Other species grow farther south and west, one species, known as the western crab-apple, resembling the American crab-apple, is found from Minnesota eastward through Wisconsin and Illinois, and extends south and west through Kentucky to Louisiana and Indian Territory. The cultivated crab-apple requires about the same treatment as the true apple. See APPLE.

Crab-eating Dog, a fox-dog (*Canis cancrivorus*), native to eastern South America from Guiana to northern Argentina, but said to be quite unknown on the pampas. It is somewhat smaller than the colpeo (q.v.) of the extreme south, and less handsome in color. In this respect it is subject to great variation, ranging from black, with bright red on the legs, to dull gray with very little black on the back, but the tip of the tail is always black. It is a forest- or jungle-dwelling animal, feeding upon rodents and birds and upon crustaceans, whence its English and Latin name. It does much damage to poultry in the inhabited districts; when hunting in the woods it follows its prey by scent, but in the open it is said to hunt by sight.

Crab-eating Ichneumon, ĭk-nū'mŏn, a mungoose (*Herpestes urva* or *cancrivorus*), native to southern Asia from the slopes of the Himalayas to southern China and Assam. It is said to be partially aquatic in habits and to live on frogs and especially on crabs, whence its name. It is, however, little known scientifically.

Crab-eating Raccoon, a kind of raccoon (q.v.) native to South America (*Procyon cancrivorus*), considerably larger than the northern raccoon and having shorter fur and proportionately much larger teeth. It is found from Panama to Colombia and Guiana. The darker sort, found further south, has often been considered as a distinct species, and called the black-footed raccoon. In habits, these South American raccoons are much like their northern relatives.

Crab Grass, or **Finger Grass** (*Panicum sanguinale*), belongs to the natural order *Gramineæ*, or grass family. It is a very common annual grass found throughout the United States and thriving in warm weather. It has erect or decumbent stems which often grow two or three feet high and bear from 4 to 15 erect or spreading spikes, which carry the flowers and fruit. It is cultivated in the southern States for hay and pasturage. The hay is easily injured if wet while curing. Its value is similar to that of Bermuda grass. It was introduced from Europe, where it is a weed, although it is cultivated on sandy land in Bohemia, the fruit being used for porridge. In the northern parts of the United States, owing to its strong roots it is difficult to eradicate and is regarded as a bad weed.

Crab Island, West Indies. See VIEQUES.

Crab-louse, one of the wingless *Hemiptera* of the family Pediculidæ or suctorial lice (*Phthirius inguinalis*). It is different in shape from the other lice, having a short and broad crab-like appearance. It is whitish, with the thick legs and claws reddish, and is nearly one tenth of an inch in length. The crab-louse infests the pubic regions of the human body, sometimes occurring among the hairs of the arm-pits, or even of the eye-brows. The insect attaches its eggs in great numbers to the hairs, as may easily be seen with an ordinary reading-glass; and the young half burrow beneath the skin, clinging tenaciously. The itch or disease called phthiriasis is due to the attacks of this repulsive pest, when occurring in great numbers. The virulence of the disease in ancient writings was probably exaggerated. Sharp suggests that in the cases of disease attributed to this insect the patient was suffering from some other disease, but being in a neglected and filthy condition was horribly infested with these disgusting creatures. Red precipitate, and any oily or greasy applications, together with frequent use of carbolic acid soap are efficient remedies.

Crab-spider, a small spider of the family *Thomisidæ*, so-called on account of its laterally bent legs and side-wise progression. The body is much depressed and the ocelli arranged in two parallel transverse rows. The *Thomisus vulgaris* and other species are common in the United States. They spin no webs except for the support of the cocoon, but pursue their prey which, owing to their flat bodies, they are enabled to seek in crevices. The claws or talons of this spider are very large and strong; sometimes they are removed, set in gold, and used as tooth-picks, being supposed to have medicinal properties as prophylactic of tooth-ache. The name is also applied to the bird-catching spider (q.v.).

Crabb, George, English lawyer and philologist: b. Palgrave, Eng., 8 Dec. 1778; d. Hammersmith, Eng., 4 Dec. 1854. He studied in Germany, and on his return to England published a series of German text-books which were long in use. In 1829 he was admitted to the bar. He was the author of 'Dictionary of English Synonyms' (1816); 'An Historical Dictionary' (1825); 'Mythology of All Nations' (1847); 'A Technological Dictionary'; 'A History of the English Law'; 'A Digest and Index of All the Statutes at Large'; 'A Technical Dictionary of Terms Used in Science and Art'; and 'A Dictionary of General Knowledge.'

Crabbe, George, English poet: b. Aldborough, Suffolk, 24 Dec. 1754; d. Trowbridge, Wiltshire, 3 Feb. 1832. Having been educated for the medical profession, he settled as a surgeon in his native village, but finding his practice insufficient to afford him a livelihood, resolved to trust to his talent for poetry for support. With this view he proceeded to London, and after a year, when on the point of being thrown into jail for debts unavoidably contracted, as a last resource, in an auspicious moment, he applied to Edmund Burke for assistance, transmitting to him at the same time some

verses as a specimen of his abilities. In these sketches Burke at once recognized the hand of a master. He invited the poet to Beaconsfield, watched over his progress, and afforded him the benefit of his taste and critical skill. Under his auspices the 'Library' was prepared for publication, and by it Crabbe was at once raised to fame. But the efforts of Burke did not stop here. By his advice and assistance — notwithstanding the irregularity of his education — Crabbe was admitted to holy orders, and obtained ample preferment. In 1783 appeared the 'Village,' which placed Crabbe's reputation on a permanent basis. Two years afterward it was followed by the 'Newspaper.' 'The Parish Register' appeared in 1807. In it Crabbe first fully developed the style which may be regarded as peculiarly his own — that minuteness, yet force and truthfulness of description, that searching analysis of human character, which stamps him as an original as well as a great poet. 'The Borough' appeared in 1810, followed in 1812 by 'Tales in Verse,' and in 1819 by 'Tales of the Hall.' The latter years of Crabbe's life were spent in the peaceful discharge of his professional duties at Trowbridge in Wiltshire. Consult 'Lives' by his son (1835); Kebbel (1888); Ainger (1902); Stephen, 'Hours in a Library' (1876).

Crabeth, krä'bĕt, **Dirk** and **Wouter,** wow'-tĕr, two famous Dutch glass painters of the 16th century: b. Gouda. Both traveled in Italy, Wouter especially being influenced by Raphael, and then each established a glass factory at Gouda. Wouter's paintings are found in France and Italy, but the best work of both brothers is in the St. Janskerk in Gouda, where Dirk painted seven windows, of which 'Driving the Traders from the Temple,' 'The Baptism by John,' and 'The Last Supper' are the finest, and show more brilliant coloring than those of Wouter. The others are: 'The Sacrifice by Elijah Before the Priests of Baal'; 'Washing the Disciples' Feet'; 'Queen of Sheba Before Solomon,' and 'The Sacrilege of Heliodorus.' Wouter died about 1601, 20 years after his brother. His work was of wider range than Dirk's, including some portraits and archer groups in the Museum of Gouda, and excelled it in drawing and in treatment of lights. Portraits of the brothers, who were bitterly jealous of each other, are in the St. Janskerk. Wouter's grandson Wouter was an historical painter.

Cra'bro (Lat. "hornet"), a genus of hymenopterous insects; belonging to the section *Aculeata*, or sting bearers, and to the sub-section *Fassores* (burrowers). The hornet (*Crabro vulgaris*) is the type of this genus, which is now raised to the rank of a family named *Crabronidæ*. Some insects of this family excavate their nests or retreats in woods. In the United States they build principally in fences, trees, etc.

Crabtree, Charlotte (best known by her stage name 'Lotta'), American actress: b. New York 1847. She made her first appearance on the stage when six years old in an amateur performance. At the age of 10 she played the part of Gertrude in the 'Loan of a Lover' at Petaluma. In 1863 she appeared in New York in spectacular plays at Niblo's Garden, and first gained a reputation in John Brougham's 'Little Nell and the Marchioness.' She soon became a favorite with the American public in pronounced comedy, playing parts especially written for her. Her chief successes have been as 'Topsy,' 'Sam Willoughby,' 'Fire-fly,' 'Musette,' 'Zip,' 'Bob,' 'The Little Detective,' and 'Nitouche.'

Cracker. See Biscuit.

Cracker Industry, The. There is, perhaps, no branch of American enterprise that has enjoyed more phenomenal development during the past few years than the cracker, or biscuit industry, for certainly there is no other single avenue of commercial endeavor that is so far reaching in its source of supply, or which brings its perfected product into so many homes.

While we have derived the name "biscuit," from the French, it originally came from the Latin, having been a word that was used to signify that the bread eaten by the Roman soldiers was sent twice to the oven. Thus, its actual meaning, "twice baked." Just how, or when it first came to be used in France, nobody can tell, but it reached the United States via England, sometime about the middle of the 19th century. Prior to that time such a title had never been applied to the product of our bakeries, although in Europe almost every article of food in the form of a sweet, flavored cake had long been known as a biscuit.

It was the latter part of the 18th century that some bakers in the United States began to produce crackers. They were crude articles of food, made of plain and unsweetened dough, always unflavored, but crisp. The reception which this product received, however, was so favorable that their use in this country not only continued to increase but there was an ever-widening demand from abroad, where the name "cracker," was dropped, all such products promptly being absorbed into the generic title, "biscuit." The name "cracker" was retained in America, however, until within the past few years, when the term "biscuit" has been adopted in some cases as a more sweeping classification.

So far as we have any authentic record, the first cracker bakery in the United States was that of Theodore Pearson, at Newburyport, Mass. Beginning business in 1792, his specialty was a large cracker which was known both as "pilot" and as "ship" bread. It was a large, round, clumsy, crisp affair, but it met the demands of the merchant marine who were glad to purchase any article of food that could be depended upon to keep for a longer period than ordinary bread.

Pearson's first great business rival was Joshua Bent, who erected an oven for cracker baking at Milton, Mass., in 1801. It was a comparatively small affair, being operated only three days in each week by Bent himself, assisted by other members of his family. During the other three days the product of the oven was sold throughout the country from a wagon. Insignificant as this beginning was it was the foundation of the manufacture of the celebrated Bent's water-cracker, another product of the American baker that has attained an international reputation. Today it is made just as it always has been, of unleavened dough (flour, water, and a little

salt). Later, of course, machinery was substituted for the old hand process, by which the dough was not only mixed and kneaded by hand, but each cracker was even rolled out and shaped separately before being placed, one at a time, on the long-handled sheet-iron shovel or peel, by which they were transferred to the floor of the oval-shaped tile oven which was then in use. So far as the use of raised, or fermented dough in the making of crackers is concerned, it has been only within the past half century that its practicability has been developed to any considerable degree.

It was in 1805 that Artemas Kennedy established his bakery at Menotomy, now Arlington, Mass. A few years later he removed to Westford, and, afterward, to Milton. The elder Kennedy died in 1832, but, in 1834, one of his sons, Jason Kennedy, inaugurated a similar enterprise at Charlestown, and, in 1840, a cousin who had been Jason's foreman, and who was also named Artemas Kennedy, went into business for himself at Cambridgeport, Mass. It was in this manner that the name of Kennedy became associated with the cracker industry of America.

The first cracker bakery in Boston was started by Richard Austin, in Ann Street, about 1830. In 1843, he was succeeded by his brother, Thomas, and the business was continued without interruptions, but under various titles, until 1885, when it again passed into the hands of the Austins, by being purchased by J. W. Austin, a descendant of the founder of the house. At later dates other firms of prominence were established throughout New England, among them Thurston, Hall & Company, of Cambridgeport, Mass.; John S. Carr, of Springfield, Mass; C. D. Boss, of New London, Conn.; Parks & Savage, of Hartford, Conn., and the New Haven Baking Company, of New Haven, Conn.

The business of cracker baking in New York was introduced about 1825, when Ephraim Treadwell founded the establishment which is now conducting its operations under the name of Treadwell & Harris. During the next 25 years several other firms entered the same business, but, although some of them attained considerable distinction in their time, all have now passed out of existence. Among them were the firms of Robert Spier, Erastus Titus, John T. Wilson, C. T. Goodwin, J. Parr, and J. Bruen.

It was in 1850, that Garrett B. and Edwin O. Brinckerhoff started their business on Madison Street, New York. In 1857, they removed to Elizabeth Street, where the Brinckerhoff branch of the consolidated company is still located. About 1860, Belcher & Larrabee established their bakery at Albany, N. Y., and in 1871, the firm name was changed to that of E. J. Larrabee & Company. In 1870, John Holmes, an Englishman, entered the services of this house, and he remained with this firm until 1877, when he entered into a partnership agreement with G. H. Coutts, under the firm name of Holmes & Coutts, opening a house which soon won both fame and fortune by its production of goods that were unlike any that had heretofore been made by American bakers. In fact, their success was so great that, a few years later, J. R. Vanderveer and D. M. Holmes erected another factory in New York, in which they also produced a high grade of goods that soon brought them more than national recognition.

It is, of course, impossible, within the limits of so brief a review, to present anything like an adequate list of the many bakeries that sprang into existence in every part of the country as soon as the success of the New England and New York bakers had become generally known. To tell the story of the cracker industry, however, it is imperative that a few of the most important of these establishments should be mentioned, among them being the firms of Hetfield & Ducker, of Brooklyn; Walter G. Wilson and A. J. Medlar & Company, of Philadelphia; James Beatty, J. D. Mason, and J. R. Skillman, of Baltimore; Haste & Harris, of Detroit, Mich.; the Margaret Bakery of New Orleans, La.; C. L. Woodman, D. F. Bremner, and the Dake Bakery of Chicago; Garneau, Dozier & Company, later Dozier & Weyl, of St. Louis, Mo., and S. S. Marvin & Company, of Pittsburg, Pa.

The interval between 1840 and 1865 represents the most important period in the history of the cracker industry, for it was during this time that the mechanical processes employed in the making of these goods underwent a development that was as remarkable as it was rapid. Prior to 1840, the use of machinery in the cracker-making business was practically unknown. Even at that late date, the dough was still worked up and put into the oven one piece at a time, all being done by hand. As the demand for crackers continued to increase, however, so slow a process was a serious drawback to the progress of the industry, and it was to improve these conditions that a machine was finally invented which took the dough, after it had been prepared by hand, and rolled it into a thin sheet, which, as it passed over a sort of endless belt, or apron, was cut into the required shapes by a stamp which rose and fell automatically. This invention, as manufactured, was crude enough, and yet, so far as its principle was concerned, it was very similar, except in the matter of size and capacity, to the most improved cracker-making machines of the present day.

Great as the demand for this kind of food had become, the discovery of gold in 1849 gave additional stimulus to the trade, for, among all the articles of food that were known at that time, not one was more suited to the purposes of the pioneer and the gold-hunter than the ordinary cracker. If this demand was to be met, therefore, it was necessary that a more rapid process should be devised, so, to cope with this emergency, the manufacturers began to turn the machines which had formerly been turned by hand, first by horse-power, and, finally, by steam-power. By these means the capacity of the various plants was increased sufficiently to meet all requirements until the War of the Rebellion, in 1861, gave the second great impetus to the industry, for no sooner had war been declared than the demand for the cracker then known as "hard bread," began to increase to such an extent that it was absolutely impossible for the manufacturers to

keep pace with their orders. Crackers were needed, however, both for the army and for the navy, and it was to meet this imperative demand for food that the mechanical reel oven was invented. This contrivance, which practically revolutionized the cracker trade, consisted of an arrangement of long iron pans, which revolved, one over the other, with an action not dissimilar to that of the Ferris wheel. The pans, which were located in the large oven-chamber, were capable of handling so large a product that the capacity of a single oven was increased from six barrels to 25 or 30 barrels of flour a day, and practically the only change that has been made in this method of baking is in the gradual increase of the size of the reels, some of those that are used at this time having a daily capacity as great as 50, or even more, barrels of flour per oven.

The increase in the variety of goods produced by American bakers did not begin to become apparent until after the introduction of the machine methods of baking. Prior to 1840, or even for some years after that date, there were only five kinds of crackers that were known to the general trade, and the few exceptions were products that were of purely local invention and sale. The standard crackers, in this period, were the old-fashioned "pilot-bread," the original hard cold-water crackers made by the Bents, the soft or butter cracker, and the square and round soda biscuit. The last three varieties differed from the older cracker both in the fact that they were products from a fermented dough, and that they contained shortening, either of butter or lard. Of these crackers, the most popular varieties for ordinary use were those that had been produced by the process of fermentation, as they were of lighter and softer texture than the old type of hard cracker.

The sweetened, or fancy cracker, more familiarly known as "biscuit," is an English invention which was placed upon the market sometime later than 1855. Among the English firms that sent their goods to the American market were Huntley & Palmer, and Peak, Frean & Company, but the products of both houses were sold so widely that they soon found it necessary to establish distributing agencies in every large city of the country. As all the important grocery houses in the United States were selling these goods, and as everybody who could afford such luxuries were buying them, it did not take long for the domestic manufacturers to recognize the fact that this was an avenue of trade that must not remain closed to the bakers of this country. Belcher & Larrabee of Albany was the first firm to take steps in this matter, but as early as 1865, they sent to England for the cutters and machines necessary to the undertaking, and their attempt to produce these sweetened and fancy biscuit was so successful that other firms soon followed their example, with the result that this branch of the cracker manufacture has gradually extended until it has become one of the greatest sources of profit to the trade. In fact, so popular did the new biscuit become that the firms of H. J. McCollum of New York, and Denio & Roberts of Boston, then the most prominent makers of bakers' supplies in America, began the manufacture of all necessary appliances for the new industry, so that they were soon able to equip all domestic plants with all machinery needed to enable them to rival the operations of the best bakeries of England. As the result, the importation of English goods not only decreased to a marked degree, but, encouraged by their success in this country, several American firms, including Holmes & Coutts, the Wilsons of Philadelphia, and F. A. Kennedy, began to introduce their high-class unsweetened goods to the European market.

In 1890, in accordance with the "consolidation" idea which was then sweeping the country, the largest plants in the United States were formed into three large companies. The first, the New York Biscuit Company, included nearly all the cracker interests in New York and the New England States, its factory in New York city being the largest and most complete in this country. The American Biscuit Company represented chiefly the West and South, while the United States Baking Company had large factories in Ohio, Indiana, and Pennsylvania. These three concerns, which then represented an aggregate capital of $25,000,000, and an annual consumption of flour which approximated 1,400,000 barrels, were again absorbed, in 1898, under the one title of the National Biscuit Company. With a capital of $55,000,000, and with bakeries in all the principal American cities, this company has not only revolutionized the methods of cracker-making, but has introduced many novel ideas, not only in the form of new varieties of crackers, or biscuit, but in the matter of air-tight packages, and other inventions which have added greatly to the commercial value of this product of our national industry.

Cracker State, a nickname applied to Georgia.

Crackers, an opprobrious name applied to the "poor whites" of the Southern States.

Cracklin, or **Crackle Ware,** chinaware ornamented by a network of small cracke in all directions. The ware receives the small cracks in the kiln, with the effect that the glaze or enamel which is afterward applied appears to be cracked all over.

Cracovienne, krā-kō-vĭ-ĕn′, a lively Polish dance in two fourths time, in which the dancers arrange themselves in couples, the one partner standing before the other. First one couple sings two stanzas to ăn air called the 'Krakoviak,' while the other couples group themselves round, then another couple takes the place of the first, and so on in succession.

Cracow, krā′ko the old capital of Poland, in 1815–46 capital of a republic of the same name now forming part of Austrian Galicia, is situated on the left bank of the Vistula, where it becomes navigable, and consists of Cracow proper, or the old city, and several suburbs. It is the see of a bishop, is well built and regularly fortified. The cathedral, a fine old Gothic edifice, contains monuments of many Polish kings, of Kosciusko, etc. The university was founded in 1364, but gradually fell into decay,

and was reorganized in 1817. It has a library of 300,000 volumes. On a hill near the town stands the monument of Kosciusko, 120 feet high. Pop. (1900) 91,323 (21,000 being Jews); with all its suburbs, 94,096.

Cracow, University of. See CRACOW.

Craddock, Charles Egbert. See MURFREE, MARY NOAILLES.

Cradle, (1) an infant's bed or cot, usually oscillating on rockers or suspended in such a way as to admit of a swinging motion. In technical language the word is applied to several mechanical contrivances employed in various trades or arts. (2) As a nautical term, a cradle is the basket run on a line and carrying to land persons from a wrecked vessel; the frame supporting a ship on the ways, and in which it slides down when launched; and the frame supporting a ship hauled over a marine railway. The frameworks sustaining heavy guns in transportation, are also called cradles. (3) In agricultural use the cradle consists of a sort of broad scythe for cutting grain. It is furnished with a set of long parallel fingers for catching the grain and laying it in swaths. (4) The cradle or rocker employed in placer-mining consists of a box agitated by hand and used for washing out gold-bearing earth.

Cradle of Liberty, a name by which Faneuil Hall, in Boston, is known. During the Revolution it was the favorite meeting-place of the American patriots. The name is also sometimes applied to the city of Boston.

Craft, William, a fugitive slave from Macon, Ga., where he hired himself of his owner and worked as a joiner. After years of planning he and his wife Ellen — who was almost white — escaped. Finally, Ellen wearing men's clothes, and William attending as her servant, they made their way to Boston, where they became parishioners of Theodore Parker (q.v.), 25 Oct. 1850. When the Crafts had been about two years in Boston, Parker learned that slave-hunters were after them, had them secreted (though William soon armed himself and went about his business), and warned the slave-hunters for their own safety to leave the city, which they did. The Crafts, never having been formally married, requested Parker to marry them, and he did so November 7, at a colored boarding-house in Boston. On a table some one had laid a Bible and a bowie-knife. The minister gave William the book, for the good of his own soul and of Ellen's, and in his right hand placed the knife, for their defense should need be. The Crafts soon after went to England, bearing a letter from Parker to James Martineau.

Crafts, James Mason, American chemist: b. Boston 8 March 1839. He graduated at the Lawrence Scientific School, Harvard, 1858; studied chemistry and other sciences at Freiburg, Heidelberg, and the Paris Ecole des Mines 1860–5. He was professor of chemistry at Cornell 1869–70, at Massachusetts Institute of Technology, 1870–80, and of organic chemistry at the latter 1892–7. The French government made him a chevalier of the Legion of Honor in 1885, and many of his investigations have been carried on in Paris with Friedel. In 1897 he became president of the Institute of Technology, resigning in 1900. He has published 'Qualitative Analysis' (1869).

Crafts, Wilbur Fisk, American Congregational clergyman: b. Freyburg, Me., 12 Jan. 1850. He was graduated at Wesleyan University in 1869, and Boston University School of Theology in 1872; preached eight years as a Methodist Episcopal minister, but in 1880 joined the Congregational Church. Later he engaged in literary work. He is secretary of the American Sabbath Union, and prominent in reform work; author of 'Successful Men'; 'The Sabbath for Man'; 'Successful Men of To-day'; etc.

Craig, James Alexander, American Semitic scholar: b. Fitzroy Harbour, Ontario, 5 March 1855. He graduated at McGill University, Montreal, 1880, and took his Ph.D. degree at Leipsic 1886. He was instructor and professor of Biblical languages in Lane Theological Seminary, 1886–90; professor of Old Testament literature and exegesis, Oberlin Theological Seminary 1891; and since 1893 has been professor of Semitic languages and Hellenistic Greek in the University of Michigan. He has published 'Inscriptions of Salmanassar, King of Assyria, 859–826 B.C.' (1887); 'Hebrew Word Manual' (1890); 'Assyrian and Babylonian Religious Texts' (1895–7); 'Astronomical-Astrological Texts of the Babylonians' (1899).

Craig, SIR James Henry, English soldier: b. Gibraltar 1748; d. London 12 Jan. 1812. He entered the army in 1763, became captain of the 47th foot in 1771, came to America in 1774, was wounded at Bunker Hill, was transferred with the 47th to Canada, and distinguished himself in the early part of Burgoyne's advance upon Saratoga. Made major of the 82d, he sailed for Nova Scotia; in 1781 fought in North Carolina; and was promoted successively lieutenant-colonel of the 82d and colonel of the 16th. In 1794 he became adjutant-general to the army in the Netherlands and was promoted major-general. On the conclusion of the war in the Netherlands, he was appointed to command a force to co-operate with the army from India in the capture of the Dutch colony at the Cape of Good Hope. The colony surrendered to him 14 Sept. 1795. He was governor at the Cape in 1795–7, and from 1797 to 1802 was in India. Having been promoted lieutenant-general in 1801, he commanded the troops in Italy and Sicily in 1805–6, operating in conjunction with the Russians against the French. In 1807 he was made local general in America, and captain-general and governor-general of Canada. The French were not well disposed toward the British government, and there were perpetual contentions in the assembly. Craig dismissed two assemblies and he or his council suppressed 'Le Canadien' newspaper. He resigned the government in October 1811, and in 1812 was promoted general.

Craighill, krāg'il, **William Price,** American military engineer: b. Charlestown, Va., 1 July 1833. He graduated at West Point 1853; superintended the building of Fort Sumter 1854–5; built the defenses of Pittsburg 1863; and on 13 March 1865, was brevetted lieutenant-colonel for faithful and meritorious services during the War. Later he was employed on the defenses of New York and Baltimore, and in the improvement of navigation on southern rivers. He became brigadier-general and chief of engineers 10 May 1895, and was retired 1 Feb. 1897.

Craigie, krāg'ĭ, **Pearl Mary Teresa Richards** ("John Oliver Hobbes"), English novelist and dramatist: b. Boston, Mass., 3 Nov. 1867. She was educated in Paris and London, married R. W. Craigie in England in 1887 and was divorced from him in 1895. Her writings, published under the pseudonym, "John Oliver Hobbes," include 'Some Emotions and a Moral' (1891); 'The Sinner's Comedy' (1892); 'A Study in Temptations' (1893); 'A Bundle of Life' (1894); 'Journeys End in Lovers Meeting'; 'The Gods, Some Mortals, and Lord Wickenham' (1895); 'The Herb Moon' (1896); 'School for Saints' (1897); 'Osborn and Ursyne,' a blank verse tragedy (1899); 'The Ambassador' a play (1898); 'Robert Orange' (1900); 'The Serious Wooing' (1901).

Craik, Dinah Maria, best known as "Miss Mulock," English novelist: b. Stoke-upon-Trent, 1826; d. Shortlands, Kent, 12 Oct. 1887. In her twenty-third year she published her first novel, 'The Ogilvies'. This was followed by 'Olive' (1850); and 'Agatha's Husband' (1853); but it was with the story of 'John Halifax, Gentleman' (1857) that she gained and retained her reputation as a novelist. This work has had an extraordinary popularity, having been translated into French, German, Italian, Greek and Russian. She published in all about twenty stories, among which were 'A Life for a Life' (1859); 'Mistress and Maid' (1863); 'A Noble Life' (1866); 'A Brave Lady' (1870); 'Hannah' (1871); etc. Besides these she was the author of a great number of essays on various subjects, such as 'Sermons Out of Church' (1875); 'Plain Speaking' (1882). She published a volume of poems in 1859, reissued with additions in 'Thirty Years' Poems' (1881). Among these 'Douglas, Tender and True', and 'Philip, My King' have been widely popular. In 1865 she was married to George Lillie Craik, a nephew of the professor of the same name. The chief characteristic of her literary work was its refined optimism, and its success with the public was largely due to simplicity of diction.

Craik, krāk, **George Lillie,** Scottish miscellaneous writer: b. Fifeshire 1799; d. Belfast, Ireland, 25 June 1866. He removed to London in 1824, became an extensive contributor to the Penny Cyclopædia in the departments of history and biography, but his first independent work of any importance was his 'Pursuit of Knowledge under Difficulties'. This was succeeded by his 'Romance of the Peerage'; 'Spenser and his Poetry'; 'History of Literature and Learning in England'; 'History of British Commerce'; 'English of Shakespeare'; 'Bacon, His Writings and Philosophy'; etc. From 1837 to 1844 he was joint editor of the 'Pictorial History of England'. In 1849 he was appointed professor of English literature in Queen's College, Belfast, an appointment which he held till his death.

Craik, Georgiana Marian. See May, Georgiana Marian.

Craik, Sir **Henry,** Scottish writer: b. Glasgow 18 Oct. 1846. He was educated at Glasgow University and Balliol College, Oxford, and has been secretary of the Scottish Education Department from 1885. He was knighted in 1897, and is the author of 'Life of Jonathan Swift' (1882); 'The State and Education' (1883); 'A Century of Scottish History' (1901). He has edited 'English Prose Selections,' in five volumes (1892–6).

Craik, James, American physician: b. in Scotland 1731; d. Fairfax County, Va., 6 Feb. 1814. He came to Virginia early in life, and on 7 March 1754 was commissioned as an army surgeon. In 1755 he was a surgeon in Braddock's army and took part in the memorable action on the Monongahela. After serving through the French war in the Virginia regiment he settled as a physician near Mount Vernon, and finally at Alexandria. During the Revolution he was in the medical department. He was Washington's family physician, and ever associated with him on terms of the closest friendship, attending him in his last illness, and being affectionately mentioned in Washington's will as "my compatriot in arms and old and intimate friend" to whom he bequeathed his tambour secretary and the circular chair, "an appendage of my study."

Craik, Robert, Canadian physician: b. Montreal 22 April 1829. He graduated in medicine at McGill University 1854; was house surgeon at the general hospital during the cholera epidemic 1854; demonstrator in practical anatomy at McGill University 1856–60; professor of clinical surgery 1860–7; professor of chemistry 1867–79; registrar 1869–77; treasurer 1875–1901; dean of the faculty of medicine and professor of hygiene and public health 1887–1901. He has devoted much attention to scientific farming, and is a successful breeder of prize pedigree cattle and thoroughbred horses. His publications are: 'Nature of Morbid Poisons and Germ Theory of Disease' (1854); 'Papers on Purpura and Tetanus' (1855); 'Hyoscyamus Poisoning' (1858); 'Antisepsis in Successful Ovariotomies and Compound Joint Injuries' (1869–71); 'Medical Education' (1890); 'History of the Medical Faculty' (1895); 'Hospital and District Nursing' (1897); etc.

Cram, Ralph Adams, American architect and author: b. Hampton Falls, N. H., 16 Dec. 1863. He was educated at private schools and academies, and has been in practice as an architect in Boston, Mass., since 1889. He has contributed verse to various periodicals and professional articles to the 'Architectural Review' (London) 'Architectural Record,' 'Atlantic Monthly,' 'The Churchman,' and 'Independent.' In book form he has published: 'The Decadent'; 'Black Spirits and White'; 'English Country Churches' (1898); 'Church Building' (1901).

Cram, William Everett, American author: b. Hampton Falls, N. H., 22 June 1871. He is a brother of Ralph Adams Cram (q.v.). He has written: 'Little Beasts of Field and Wood' (1899); 'More Little Beasts' (1901); and in collaboration with Witmer Stone, 'American Animals; Guide to the Mammals of North America North of Mexico' (1902).

Crambe, krām'bē, a genus of plants belonging to the natural order *Cruciferæ*. The best-known member of this genus is sea-kale, a hardy perennial found on the coasts of Great Britain, as well as France and the shores of the Baltic. The common people on the western shores of England from time immemorial have been in the habit of watching when the shoots

begin to push up the sand or gravel in March and April, then cutting off the young shoots and leaf-stalks while still blanched and tender, and boiling them for food. When cultivated in gardens the young spring shoots are blanched by being earthed up, and resemble asparagus. One species is the tartar-bread of the Hungarians. It is eaten as a salad, either raw or boiled.

Cramer, Michael John, author and minister of the Methodist Episcopal Church: b. Schaffhausen, Switzerland, 6 Feb. 1835; d. Carlisle, Pa., 25 Jan. 1898. He graduated at Ohio Wesleyan University, Delaware, O., 1860, and served as chaplain in the United States army 1864–7; was United States consul at Leipsic 1867–70; United States minister to Denmark 1870–81; United States minister to Switzerland 1881–5. He was appointed professor of systematic theology at Boston University 1885–7, resigning in that year on account of ill-health. He became associate editor of the 'Theological Quarterly Review' in 1889, and contributed largely to the 'Methodist Review,' the 'German Theological Review,' and other periodicals. After filling the chair of church history at Drew Theological Seminary for a year he became in 1897 professor of philosophy in Dickinson College.

Cramp, Charles Henry, American shipbuilder: b. Philadelphia, Pa., 9 May 1828. He was graduated at the Central High School of his native city, and entered the shipyards of his father, William Cramp. He soon established the prestige of the firm of William Cramp & Sons, which he incorporated and of which he became president. Their shipyards in Philadelphia are the most extensive in the United States, executing contracts for the governments of the United States, Russia, Japan, etc., and exercising a great influence upon modern naval development.

Cramp, acute, painful sensations usually located in a voluntary muscle. It is a form of local clonic spasm in the muscle and may be due to one of several causes, the most important of which, however, are over-exertion with consequent tire and cold, or it may result from organic disease. Cramps occurring in hollow viscera where there is much involuntary muscular tissue are usually termed colic (q.v.). The muscles most often affected are those of the extremities, especially those of the lower extremities. In the cramps which result from occupation, neuroses, such as occur in telegraphers, typewriters, violinists, musicians, etc., the upper extremities are involved. These cramp-like pains are distinctly of nervous origin. The treatment of general forms of cramp is by means of warmth, massage; bromides and camphor are sometimes useful. Sudden putting of the muscle on vigorous stretch ofttimes will relieve cramp. Cramps attacking swimmers are particularly difficult to handle, but if the presence of mind of the swimmer is not lost, turning on the back and floating may prevent drowning.

Cramp Bark. See VIBURNUM.

Cramp'ton, Charles Albert, American chemist: b. Davenport, Ia., 18 Feb. 1858. He was graduated at the University of Michigan in 1882; was assistant chemist in the United States Department of Agriculture 1883–90; and has been chief chemist of the Internal Revenue Bureau since 1890. He has written extensively on agricultural and food chemistry, his papers appearing for the most part in chemical journals and government publications. Among them are: 'Record of Experiments at Des Lignes Experiment Station, Baldwin, La., 1888' (1889); 'Baking Powders' (Part V. of Food and Food Adulterations, Washington, 1889).

Cramp'ton, Thomas Russell, English engineer: b. Broadstairs, Kent, 6 Aug. 1816; d. London 19 March 1888. His engineering training was received under such men as the elder Brunel, Sir Daniel Gooch, and John and George Rennie. During 1842–8 he made many improvements in locomotive machinery, and in 1843 designed and patented the engine which bears his name. "The characteristic features of the Crampton engine are a long boiler, outside cylinders set in the middle of the engine's length, and large driving wheels placed quite in the rear of the driving box." Napoleon III. made him an officer of the Legion of Honor for this invention. In 1851 he laid the first practical submarine cable between Dover and Calais, his best piece of professional work. Among other works carried out either wholly or in part by him were the Berlin waterworks; the Smyrna railway; and the Varna railway. He also invented a rotary dust-fuel furnace, and an automatic hydraulic tunnel boring machine. The outside fire-box shells on many modern engines are still known as Crampton's.

Crampton's Gap. Battle of. See SOUTH MOUNTAIN, BATTLES OF.

Cranach, krä'näh, **Kranach,** or **Kronach, Lucas,** German painter and engraver: b. Kronach, Germany, 1472; d. Weimar 16 Oct. 1553. His family name is said to have been Muller, and the name by which he afterward called himself is said to have been taken from his birthplace. In 1504 he became court painter to Frederick the Wise, elector of Saxony, and in 1508 he was ennobled. In 1509 he traveled through the Netherlands and at Malines painted the portrait of the future emperor Charles V., then a child of nine years. He was the intimate friend of Luther, of whom he painted various portraits, several of them still extant. After the death of the elector Frederick he still remained attached to the Saxon court, for he received as much favor from Frederick's successors — John the Constant and John Frederick the Magnanimous. Cranach's portrait of the latter is contained in the New York Metropolitan Museum. After the battle of Muhlberg, in 1547, in which John Frederick was taken prisoner by the troops of Charles V., Cranach showed his attachment for his master by following him from prison to prison until in 1552 he was set at liberty, when he returned with Cranach at his side to Weimar. He engraved both on copper and wood, and also illuminated manuscripts, and was remarkable for his rapidity of execution. He painted a large number of Madonnas, perhaps the most celebrated of which are to be seen in the cathedral of Glogau and the Pinakothek of Munich. Another favorite subject with him was Christ blessing the little children. Perhaps the most beautiful of his paintings on this subject is contained in the city church of Naumburg. There is a remarkable picture by him in the cathedral of Meissen, representing Christ between Mary and John, with a choir of angels

above. See Heller, 'Das Leben und die Werke Lucas Cranachs' (2d ed. 1844); Schuchardt, 'Lucas Cranach des Aelteren Leben und Werke' (1851–61).

Cranach, Lucas, German painter: b. 4 Oct. 1515; d. 25 Jan. 1586. He was the second son and a pupil of Lucas Cranach, whose manner he copied so faithfully that many of his father's works are assigned to the son. Moreover, each used a similar mark, a crowned serpent with wings. According to Schuchardt, the son varied his mark by showing the wings of the serpent folded instead of erect, as in the pictures signed by the father. His 'Crucifixion' and 'The Lord's Vineyard,' symbolical of the progress of the Reformation, are in the Stadt Kirche at Wittenberg. Other pictures of his may be found in Dresden, Berlin, and Munich.

Cranberry, several trailing species of the genus *Vaccinium*, of the natural order *Ericaceæ*. Two of these species are extensively cultivated in the United States for their acid fruit which ripens in the autumn and may be kept until spring, and which finds an important culinary use in the making of sauce, pies, etc., but is never eaten as a dessert fruit. The crop of 1900 was reported to be 987,516 bushels, produced mainly in Massachusetts, New Jersey, and Wisconsin, the balance being made up from smaller areas in the northern States. Though one of the species (*V. oxycoccus*) is a native of Europe as well as America, it has not developed European horticultural varieties. Indeed, in Europe the cranberry is cultivated to a much smaller extent than in America.

The two species from which the cultivated varieties have been derived are *V. oxycoccus*, the smaller cranberry, and *V. macrocarpon*, the larger cranberry. Both are natives of northern swamps and marshes, especially such as are rich in peat; the latter species is confined to North America. Both are trailing vines bearing small evergreen leaves, inconspicuous flowers and globular or pyriform red fruits borne on slender curved stalks, which suggested the name *crane-berry* — the neck of a crane. The American species is most cultivated and has developed the largest number of horticultural varieties, but the smaller cranberry is considered by many to produce finer flavored fruits. The general types of berries are, globular, bell-shaped, and bugle-shaped, with numerous varieties in each class.

Commercially, cranberries are grown in low, wet ground, though they are sometimes raised upon drier soils. The land selected must be drained, so that standing water will be at least a foot below the surface of the soil during summer; it must be retentive of moisture, since the plants quickly suffer in dry seasons; it must be level in order to be readily flooded in very dry weather, in winter and when insects are seriously troublesome; it must be situated where injury from frosts will be as little as possible. Late spring frosts injure the blossoms; early autumn ones, the fruit. Further, there must be sufficient water to quickly flood the field. Bogs in which sphagnum moss grows upon a peat or muck soil are preferred and are considered specially promising if plants related to the cranberry grow naturally upon the land. Draining the bog and clearing it of trees, brush, roots, moss, etc., is followed by the digging of permanent open ditches two to four feet deep. These spread the water and remove it in times of flooding, etc. After the land is prepared it is usually covered with a few inches of sand to keep down weeds and thus reduce the cost of maintenance. In this sand cuttings six or eight inches long are set at intervals of from 12 to 15 inches apart each way. Beyond the removal of weeds no cultivation is generally given. The third or fourth year a full crop may be expected; 50 barrels being a good yield, though four times that amount has been obtained. When the beds become too full of vines they are mown or burned over to start a fresh growth, and every fourth or fifth year a fresh covering of an inch or so of sand is given. Sanding is not practised in some localities. The cost of preparing and planting a bed as above indicated varies from $300 to $500 an acre. Harvesting is done by hand when highest grades are picked; by raking and combing for the less choice.

Several diseases and insects attack the cranberry. Of the former the most serious is probably the scald, which appears most frequently in hot muggy seasons as a soft reddish-brown spot on the fruit, which quickly swells and gets hard, but later shrivels and either drops off or remains attached to the vine. The leaves are also more or less affected. Promptly sanding the bog lightly is found to be the most satisfactory method of treatment. It is usually most easily done while the bed is flooded. Red galls are often troublesome upon the leaves. This is controlled by burning the beds over in the autumn to kill the spores of the fungus. A large and conspicuous distortion and reddening of the green parts may sometimes prove destructive. The leading insect enemies are two caterpillars, one of which attacks the foliage, the other the fruit. The former, known as the black-headed fireworm may be controlled by the application of kerosene or Paris green. The latter, a kind of span-worm, may be destroyed by spraying with an arsenite when the leaves are falling and the fruit is setting. Generally, perhaps the beds are flooded to destroy these and other insect pests.

Several other plants bear the name cranberry. Among the best-known are: *Vaccinium vitis-idæa*, known as low-bush cranberry, wolf-berry, mountain cranberry, and cowberry. It is a native of Europe and America and is often found in the markets, but is not cultivated. Its fruits reach American markets not only from the northern United States and eastern Canada, but often from Norway, Sweden, Denmark, and Germany. The high-bush, high cranberry, or cranberry-bush, is a shrub which attains a height of 12 feet and bears scarlet berries which persist during winter. The fruit is scarcely edible. This plant is the original species from which the snowball or guelder rose has been developed. In both forms it is a very attractive and popular ornamental shrub.

Consult: Bailey, 'Cyclopædia of American Horticulture' (New York 1900–2); White, 'Cranberry Culture' (New York); Webb, 'Cape Cod Cranberries'; Special Bulletin *K*, New Jersey Experiment Station, 'Insects Injuriously Affecting Cranberries'; 'Proceedings of the American Cranberry Growers' Association' (Trenton, N. J., 1880–1903).

Cran'brook, Gathorne Gathorne-Hardy, Earl, English statesman: b. Bradford 1 Oct. 1814. Educated at Shrewsbury and at Oriel

College, Oxford, he was called to the bar in 1840, and in 1850, after unsuccessfully contesting Bradford nine years earlier, was elected to Parliament as a Conservative by Leominster. In 1865 he defeated Mr. Gladstone in the celebrated Oxford University election; in 1878 he was raised to the peerage as Viscount Cranbrook. He was under-secretary of state for the Home Department (1858–9), president of the Poor law Board (1866–7), home secretary (1867–8), war secretary (1874–8), secretary of state for India (1878–80), and lord president of the council (1885–92).

Cranch, Christopher Pearse, American artist and poet: b. Alexandria, Va., 8 March 1813; d. Cambridge, Mass., 20 Jan. 1892. He was a son of William Cranch (q.v.). He studied at Columbian University, Washington, D. C.; was graduated at the Harvard Divinity School 1835; preached in Unitarian pulpits for a few years, and then gave himself up entirely to painting and poetry. He studied in Italy 1846–8, 1853–63, when he returned to America and was elected a member of the National Academy, but exhibited nothing after 1871. He was an intimate friend of Lowell and Longfellow; a man of versatile if not commanding talent; and one whose friendship was highly cherished by the few favored with it. Some of the best known of his paintings are: 'Val de Moline, Amalfi, Italy' (1869); 'Venice' (1870); and 'Venetian Fishing Boats' (1871). His well-known poem 'Thought' appeared in 'The Dial' (1840). His published works include: 'Poems' (1844); 'The Last of the Huggermuggers' (1850); 'Kobboltozo' (1857); a blank verse translation of the 'Æneid' (1872); 'Satan: a Libretto' (1874); 'The Bird and the Bell, and Other Poems' (1875; 2d ed. 1890); 'Ariel and Caliban' (1887).

Cranch, William, American jurist: b. Weymouth, Mass., 17 July 1769; d. Washington, D. C., 1 Sept. 1855. He was graduated at Harvard in 1787; admitted to the bar in 1790; appointed an associate judge of the United States circuit court for the District of Columbia in 1801; and chief justice of that court in 1805. He held this office till his death, and during a period of over half a century had only two decisions overruled by the supreme court. His reports of cases decided in the circuit court (1801–41) were published in six volumes; and those of the United States supreme court (1801–15) in nine volumes, with supplementary issues in 1835.

Cran'dall, Charles Henry, American writer: b. Greenwich, N. Y., 19 June 1858. He was for five years on the staff of the New York *Tribune,* and in book form has published: 'The Season; a Social History of New York' (1883); 'Representative Sonnets' (edited) (1891); 'Wayside Music' (1893); 'The Chords of Life' (1898), the last two being volumes of poems.

Crandall, Charles Lee, American civil engineer: b. Bridgewater, N. Y., 20 July 1850. He was graduated from Cornell University in 1872 and has been connected with that institution as instructor and professor of engineering from 1874. He has published: 'Tables for Computation of Railway and Other Earthwork' (1886); 'Notes on Descriptive Geometry' (1888); 'Notes on Shades, Shadows, and Perspective'; 'The Transition Curve' (1893).

Crandall, Prudence. See PHILLEO, PRUDENCE CRANDALL.

Crane, Bruce, American painter: b. New York 1857. He studied under A. H. Wyant, and paints chiefly landscapes, using American subjects. Among his works are: 'An Old Mill Pond on Long Island'; 'On Shrewsbury River'; 'Winter'; 'Harvest Field'; 'Signs of Spring'; and 'Peace at Night.' He is a member of the American Society of Artists; and won a medal at the Pan-American Exposition in 1901.

Crane, Ichabod, the country schoolmaster in Irving's 'Legend of Sleepy Hollow,' who was frightened away from the Hollow by his adventure with the Galloping Hessian.

Crane, Stephen, American novelist and poet: b. Newark, N. J., 1 Nov. 1870; d. Badenweiler, Germany, 5 June 1900. 'The Black Riders and Other Lines' (1895), a collection of verse, was his earliest volume, followed by his 'Red Badge of Courage' (1896) which excited a widespread interest in its author and seemed to presage a career of more than ordinary brilliancy. His later works are: 'Maggie: a Girl of the Streets' (1896), 'George's Mother' (1896); 'The Little Regiment' (1897); 'The Third Violet' (1897); 'The Open Boat' (1898); 'The Eternal Patience' (1898); 'Wounds in the Rain' (1900); 'Great Battles of the World' (1901); 'Whilomville Stories.' During the Spanish-American war he was a reporter in Cuba for the New York *Journal.*

Crane, Thomas Frederick, American scholar: b. New York 12 July 1844. He was educated at Princeton College, and became professor of romance languages at Cornell University in 1881. Besides many contributions to periodicals, he has written: 'Italian Popular Tales' (1885); 'Pictures of the French Revolution' (6th ed. 1892); 'French Romanticism' (3d ed. 1890); 'Popular Songs of France' (1891), etc.

Crane, Walter, English artist and writer: b. Liverpool 15 Aug. 1845. He became apprentice to W. J. Linton, the well-known wood engraver, in 1859, and soon began to illustrate books. In 1888 he became first president of the Arts and Crafts Exhibition Society. In the following year he became associate of the Royal Society of Painters in Water Colors, and from 1893 till 1896 was director of design in the Manchester Municipal School of Art. Mr. Crane's principal publications are: 'Picture Books' (1865–76); 'Baby's Opera' (1877); 'Grimm's Household Stories' (1882); 'The First of May' (1883); 'The Sirens Three: a Poem' (1885); 'Flora's Feast' (1889); 'Queen Summer' (1891); 'Renascence' (1891); 'Claims of Decorative Art' (1892); 'Decorative Illustrations of Books' (1896); 'Spenser's Faerie Queene' (1895–7); and 'Shepherd's Calendar' (1897). Among his pictures are: 'Renascence of Venus' (1877); 'Fate of Persephone' 1878; 'Europa' (1881); 'The Bridge of Life' (1884); 'Freedom' (1885); 'La Belle Dame Sans Merci,' 'England's Emblem' (1895); 'The Rainbow and the Wave' (1896); 'Britannia's Vision' (1897); and the 'World's Conquerors' (1898). Mr. Crane belongs essentially to the imaginative and poetic school so prominent among recent artists. He has prominently identified himself with the Socialist movement as lecturer, writer, and artist.

Crane, William Henry, American actor: b. Leicester, Mass., 1845. He made his first appearance on the stage when 18 years old and soon won recognition as a comedian. His role in 'The Henrietta,' in which he was associated with Stuart Robson, was his first great success. His first starring tour after dissolving connection with Robson was undertaken in 1889, when he appeared in 'The Senator.' He played 'David Harum' in 1900 and attained great popularity in that role.

Crane, Winthrop Murray, American paper manufacturer: b. Dalton, Mass., 27 April 1853. He was lieutenant-governor of Massachusetts 1897–9, and governor of the State 1900–2. In December 1901 he was offered, but declined, the position of secretary of the treasury. In 1904, upon the death of Senator Hoar, he was appointed to the Senate, and in January 1905 elected to fill his unexpired term.

Crane, the English name, with cognate words in most other European languages, originally applied to a large European wading bird, the *Grus communis* of ornithologists, but now extended to include allied species in all parts of the world. The cranes constitute a family (*Gruidæ*) most closely related to the rails (*Rallidæ*), with which they are usually placed in the order *Grallæ*. Although having the form and aspect of the herons (*Ardeidæ*) with which these birds are originally placed by Linnæus in his genus *Ardea,* the two are by no means closely allied.

The *Gruidæ* have the following characteristics: Bill longer than head, straight, rather slender, and compressed, but strong and not very acute; the two mandibles sub-equal; nostrils large, elliptical, completely perforated, situated near the middle of the bill at the anterior end of a wide, shallow nasal furrow; plumage firm, with few, flowing, elongated feathers, and lacking powder-down tracts; wings moderate, with the first and fifth primaries sub-equal; tail is short, consisting of 12 feathers; head usually partly naked, with warts or wattles, sometimes crested; neck and legs very long, the latter largely naked and tarsi scutellate in front; feet strong, with anterior toes elongated and provided with a rudimentary web, hallux very short, elevated. Fifteen species or more are known from various parts of the globe, most of which belong to the typical genus *Grus,* though under modern usages this may be subdivided. Eastern Asia is the stronghold of the cranes, claiming one half of the species. Three occur in North America, but, although very large birds, they are not generally well-known. The white or whooping crane (*G. americana*) stands between four and five feet high; it is pure white with black wings. It inhabits the Mississippi valley and the country to the north, but was once more widely distributed. It is remarkable for the resonant, piercing call, the volume of which is due to the great length of the trachea, two feet or more of which occupies a cavity within the keel of the sternum. The sandhill cranes (*G. canadensis* and *G. mexicana*) which are somewhat smaller, and gray or brown in color, likewise inhabit the interior plains of North America.

The common crane of Europe (*Gros communis*) has attracted so much notice that its habits are more familiar. These birds are of considerable size, and remarkable for their long necks and stilt-like legs, which eminently fit them for living in marshes and situations subject to inundations, where they usually seek their food. This is principally of vegetable matter, consisting of the seeds of various plants or grains plundered from grounds recently plowed and sown. They also devour insects, worms, frogs, lizards, reptiles, small fish, and the spawn of various aquatic animals. They build their nests among bushes or on tussocks in the marshes, constructing them of rushes, reeds, etc., surmounted by some soft material. They lay but two eggs, for the incubation of which the male and female alternately take their place on the nest. During the time one is thus engaged, the other acts as a sentinel; when the young are hatched, both parents unite in protecting them.

The cranes annually migrate and perform journeys astonishing for their great length and hazardous character, transporting themselves from the tropical heat of southern India and central Africa to the icy wastes of Lapland and Siberia. They are remarkable for making numerous circles and evolutions in the air when setting out on their journeys, and generally form two lines meeting in an angle forward, led by one of the strongest of their number, whose trumpet-like voice is heard as if directing their advance, when the flock is far above the clouds and entirely out of sight. To this call-note of the leader the flock frequently respond by a united clangor, which, at such a distance, does not produce an unpleasant effect. From the sagacity with which these birds vary their flight, according to the states of the atmosphere, they have, from the earliest ages, been popularly regarded as indicators of events; and their manœuvres were attentively watched and interpreted by the augurs and aruspices among the Romans — a circumstance which, together with their general harmlessness and apparent gravity of demeanor, led to their being held in a sort of veneration, even by some civilized nations. When obliged to take wing from the ground, cranes rise with considerable difficulty, striking quickly with their wings, and trailing their feet along and near the ground until they have gained a sufficient elevation to commence wheeling in circles, which grow wider and wider until they have soared to the highest regions of the air. When their flight is high and silent, it is regarded as an indication of continued fine weather; they fly low and are noisy in cloudy, wet, or stormy weather. Against approaching storms the cranes, like various other birds of lofty flight, readily guard by ascending above the level of the clouds, and the atmospheric currents which bear them. When a flock of cranes is engaged in feeding, or while it is at rest, and the birds are standing on one foot asleep, with the head under the wing, one of the number acts as sentinel and keeps a vigilant watch, alarming the whole if any enemy approach, or the slightest danger threaten.

Cranes are said on good authority to mate for life, and to return annually to the same nesting site; but, except during the breeding season, they are not gregarious. The European crane was formerly common in the marshy districts of Great Britain, where it was known to breed in the 16th century, but now occurs only as a winter straggler. Cranes of various species

both native and exotic, are common in zoological gardens, where their stiff-legged dances and other antics excite much amused interest. One of the most frequent is the elegant demoiselle crane (*Anthropoides virgo*) of southern Asia and the Mediterranean countries. Consult Legetmeier, 'Natural History of the Cranes' (1881).

Crane, a mechanical device for lifting heavy objects. See Hoisting Apparatus.

Crane-fly, or **Daddy-long-legs**, species of *Tipula*, etc., of the dipterous family *Tipulidæ*. These flies are very common and known by their large size and long sprawling legs. The antennæ are rather long and slender, and the hind body long, slender, and cylindrical. They possess a distinct ovipositor, with two pairs of long horny pointed valves. The larva is a footless grub, like a maggot, which lives under stones in brooks or in damp soil; its head is distinct, and in this respect the larva is more primitive and generalized than are those of most flies. It breathes by a pair of spiracles situated at the extremity of the body. There are many species of crane-flies in the United States.

Crane's-bill, the common name of the typical genus of the geranium family, *Geraniaceæ*, so named because of the long slender beak of the fruit of the plant. The genus has about 175 species, which are widely distributed throughout the temperate regions of the world, of which 16 are found in North America. The plants are mostly useless weeds, although some of them have very showy flowers. Other common names of American species are alum-root, red robin, etc. See Geranium.

Craney Island, an island in Norfolk County, Va., near the mouth of the Elizabeth River and west of the entrance. Here is situated a lighthouse 50 feet in height, standing on an iron pier. There are government powder magazines on the island.

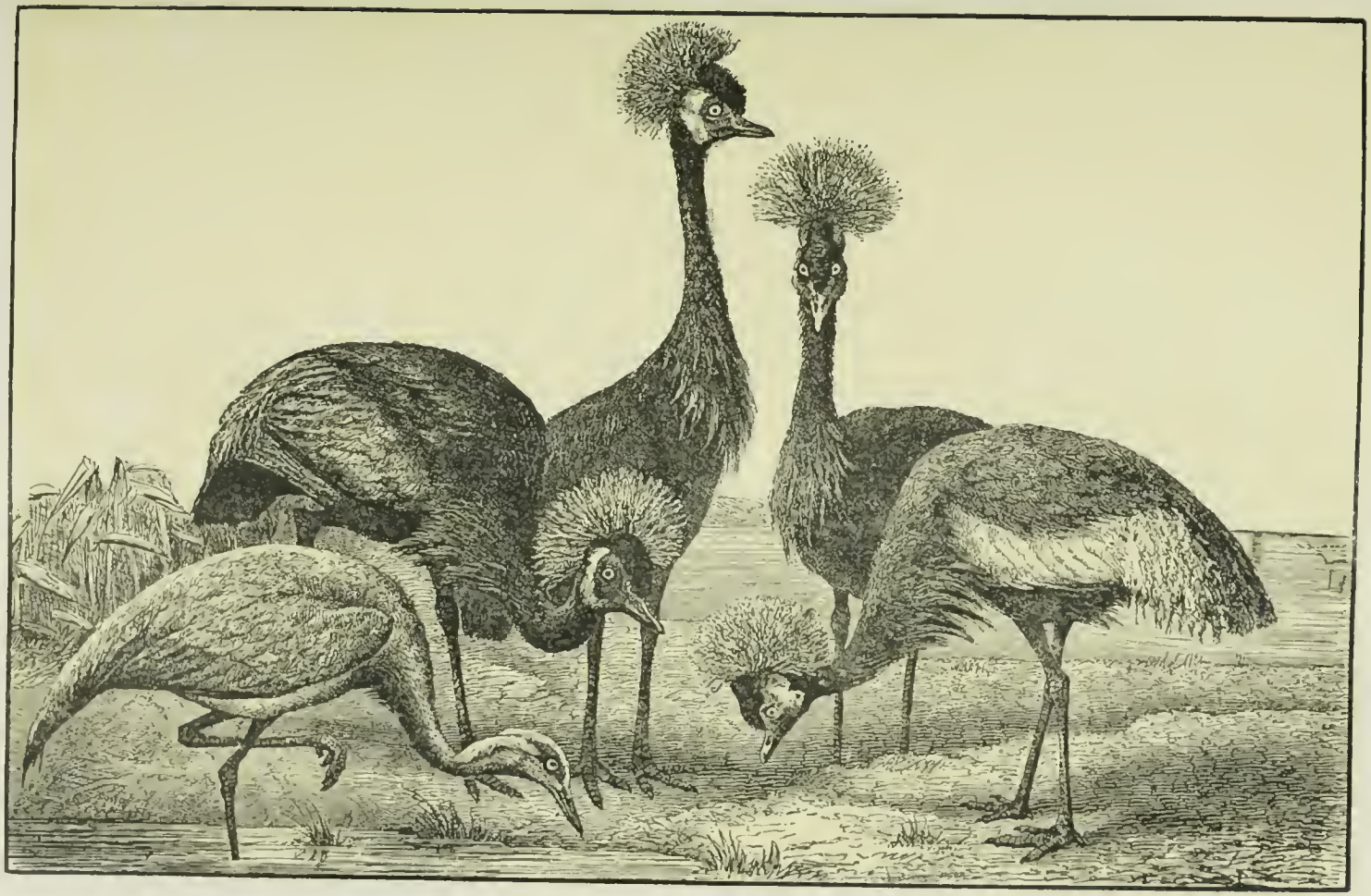
Craney Island, Battle of, 22 June 1813, in the War of 1812: a British fiasco. The island is at the mouth of Elizabeth River, Va., where it opens into Hampton Roads, and lies close to the shore at the west, separated by a shallow strait and opposite a tidal creek. To guard the entrance to Norfolk, Portsmouth, and the navy yard, a battery of seven guns had been placed on the island, with about 700 men, and 15 or 20 gunboats were anchored across the river channel. Admiral Warren ordered Sir Sydney Beckwith with 800 men to land on the mainland and take the island in rear, while Capt. Pechell with 700 in barges landed on the island from the northwest, out of range of the gunboats. Beckwith came to the rear of the island, found the creek and strait too deep to risk fording — or according to Warren's report, the island was too strongly fortified to attack — and reembarked without an effort, 40 men deserting. Pechell's boats grounded in shoal water some hundreds of feet from the island; the seamen sounded and found deep mud below; three of the barges were sunk by the American guns, and the American troops waded out to musket-range and fired at the marines, killing three and wounding 16, while 20 deserted to the Americans. The remaining boats took in their comrades and retired. There were no American losses.

Cran'ford, a popular story by Mrs. Gaskell, published in 1853. Cranford is a village in England (identified as Knutsford); and the story of the quaint ladies there — who scorned the "vulgarity of wealth" and practised "elegant economy" — is told by Mary Smith, a sympathetic and discerning young person from the neighboring town of Drumble. The book not only holds its place as one of the best stories of its kind, but increases in popularity with each year and may be said to have already become an English classic.

Cranganore, krăn-gă-nōr' (*Corangalur*), India, a town in Hindustan, in the presidency of Madras, on the Malabar coast, lying north of a small bay, 16 miles north of Cochin. It has much historic interest, especially as one of the earliest seats of Christianity in India. Syrian Christians are said to have been settled here since 345. Pop. 10,000.

Cranial Nerves, 12 important pairs of nerve branches which have their origin close to the brain stem and are connected with some of the most important functions of the body. The first or olfactory, the second or optic, the fifth or trigeminal, and the eighth or auditory, are largely sensory in their function, whereas the third or oculomotor, fourth or trochlear, sixth or abducens, seventh or facial, the ninth or glosso-pharyngeal, tenth or vagus, eleventh or spinal accessory, and twelfth or hypoglossal, are largely motor in their function. The sensory nerves originate in ganglia situated outside of the nervous axis, whereas the origin of the motor nerves is found in the medulla.

The first or auditory nerve originates in the mucous membrane of the nose and sends its fibres backward into the brain, where perceptions of smell are located. The second or optic nerve originates in the ganglion cells of the retina and then passes by an extremely complicated series of tracks to the occipital area of the brain. Here sight memories are stored, and destruction of this portion of the brain results in a form of aphasia (q.v.). The fifth nerve is a mixed nerve, containing both sensory and motor fibres. The sensory fibres originate largely from the Gasserian ganglion, and the fibres are distributed over the surface of the face, neck and head, conveying sense impressions of touch. Branches also go to the teeth, and toothache is usually an affection of these branches of the fifth nerve. The motor portion of the nerve originates in the medulla and is distributed to a number of the muscles of the jaw and throat. The eighth nerve originates in the organ of Corti in the ear and passes by a very complicated series of fibre tracks into the temporal lobe, where sense impressions of hearing are stored. The ninth, tenth and eleventh nerves are mixed, containing both motor and sensory fibres, the sensory fibres innervating the pharynx, tonsils, œsophagus, stomach, mucous membrane of the larynx, the motor fibres being distributed to the various muscles of the tongue, pharynx, larynx, heart and lungs. The tenth nerve is of particular interest in that it is the great nerve of the heart and lungs, being the chief inhibitory or regulatory nerve of the heart. Of the purely motor nerves the third or oculomotor is distributed to a number of muscles of the eye. The fourth innervates the muscles of the eye, as does also the sixth. The seventh innervates



The Demoiselle Crane (Grus virgo).

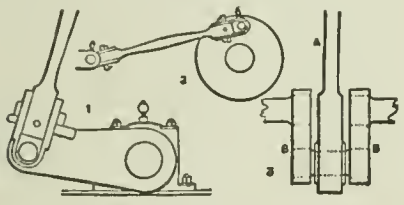
The Crested Crane (Balearica pavonina).

the muscles of the face, and in facial palsy this nerve is affected. The twelfth nerve is exclusively motor, originates in the medulla and is distributed to the muscles of the tongue and associated muscles at the base of the skull. The cranial nerves are continuous with the spinal nerves, but are more highly specialized. Consult 'Cranial Nerves' in Buck, 'Reference Handbook of the Medical Sciences,' Vol. III.

Craniol'ogy, a scientific study of the cranium. It is generally held to be the same as phrenology, but the examination of the cranium is an essential part of anatomy, altogether independent of the inferences with regard to the mental proclivities which may be deduced from it. The comparison of different crania is also essential to archæology and ethnology, and notably to anthropometry. The capacity of the brain-pan is a secondary object of study, the primary one being the comparison of the three dimensions, from the bulge of the eye-brow to the back of the skull, from the root of the ear to the top of the skull, the horizontal or profile line, and the line from the tip of the nose to the base of the ear. Especially important are the angles made by these lines. These measurements are lateral. Vertical measurements are the greatest breadth of the skull and of the jaw bones, and frontal measurements are the maximum width and height of the eye-socket and its horizontal and vertical distances and the greatest breadth of the nasal opening. To criminologists the comparative dimensions of the sides of the face are of further importance. Large divergence of one side is frequently a mark of the criminal and degenerate.

Cranium. See SKULL.

Crank, in machinery, a lever or arm on a shaft, driven by hand (for example, a winch-handle), or by a connecting-rod, its object being



Crank.

to convert reciprocating motion into rotary motion. Engine-cranks which convert the to and fro motion of the piston into continuous rotation of the crank-shaft are connected to the piston-rod end by the connecting-rod. They are, when single, of steel, wrought iron, or cast iron, the crank in this case being either a simple arm, enlarged at one end to fit over the shaft, and with a pin at the other end embraced by the rod end (fig. 1); or else a disk centred on the shaft, with crank-pin as before (fig. 2). This last form is well balanced. When double, as is usual in large engines (fig. 3), they are now often built up of steel, the two arms being shrunk on to the shaft, and pin on to them. In two positions during each turn, a connecting-rod exerts no power of rotation, namely when rod A and crank-arms B are parallel (as in fig. 3 and opposite position), and are the dead centres; all the push or pull of the rod only causes pressure on shaft-bearings. To carry the crank over these points a heavy wheel (fly-wheel) is attached to the shaft, which stores up energy during other parts of the revolution, and gives it out at these points, or two or more cranks are so placed on the shaft that when one is on its dead centre, the others are exerting nearly their maximum effort, which is when rod and crank are at right angles.

Cran'mer, Thomas, English prelate and reformer: b. Aslacton, Nottinghamshire, 2 July 1489; d. Oxford 21 March 1556. He was educated at Cambridge, and in 1523 was chosen reader of theological lectures in his college, and examiner of candidates for degrees in divinity. In the course of conversation on the meditated divorce of Henry VIII. from Catharine of Aragon Cranmer remarked that the question of its propriety might be better decided by consulting learned divines and members of the universities than by an appeal to the Pope. The opinion thus delivered gained the favor of the king and Cranmer was sent for, made a king's chaplain, and commanded to write a treatise on the subject of the divorce. In 1530 he was sent abroad with others to collect the opinions of the divines and canonists of France, Italy, and Germany, on the validity of the king's marriage. At Rome he presented his treatise to the Pope, and afterward proceeded to Germany, where he obtained for his opinions the sanction of a great number of German divines and civilians, and formed such intimate connections with the rising party of the Protestants as probably influenced greatly his future conduct. In January 1533 he was announced as the new archbishop of Canterbury, and on 30 March he was consecrated at Westminster. Soon after, he set the papal authority at defiance, by declaring invalid the marriage between Henry and Catharine, and confirming the king's marriage with Anne Boleyn. Next year an act of Parliament was passed for abolishing the Pope's supremacy, and declaring the king chief head of the Church of England. The new or revised English translation of the Bible, now appointed to be placed in churches, received the name of 'Cranmer's Bible.'

On the death of Henry, in 1547, the archbishop was left one of the executors of his will, and member of the regency appointed to govern the kingdom during the minority of Edward VI. He proceeded to model the Church of England according to the notions of Zuinglius, rather than those of Luther. By his instrumentality the liturgy was drawn up and established by act of Parliament, and articles of religion were compiled, the validity of which was enforced by royal authority, and for which infallibility was claimed. The exclusion of the Princess Mary from the crown, by the will of her brother, was a measure in which Cranmer joined the partisans of Lady Jane Grey, apparently in opposition to his own judgment. With others who had been most active in her elevation, he was sent to the Tower on the accession of Mary. He was tried for treason, and being condemned was sentenced to death, but was spared by the queen, though he lost his position as archbishop of Canterbury. In March 1554 he was sent to Oxford with Ridley and Latimer, and after being kept in prison for nearly a year and a half they were formally tried. Cranmer's trial took place before a papal commissioner, on the charges of blasphemy, perjury, incontinence, and heresy,

and he was sentenced to be degraded and deprived of office. After this, promises were made, which induced him to sign a recantation of his alleged errors. The triumph of his enemies was now complete, and nothing was wanting but the sacrifice of their victim. To make the tragedy more impressive, he was placed on a scaffold in St. Mary's Church, the day he was to suffer, there to listen to a declaration of his faults and heresies, his extorted penitence, and the necessity of his expiating, by his death, errors which Heaven alone could pardon, but which were of an enormity too portentous to be passed over by an earthly tribunal. Instead of confessing the justness of his sentence, and submitting to it in silence, or imploring mercy, he calmly acknowledged that the fear of death had made him belie his conscience; and declared that nothing could afford him consolation but the prospect of extenuating his guilt by encountering, as a Protestant penitent, with firmness and resignation, the fiery torments which awaited him. He was immediately hurried to the stake, where he kept his right hand, with which he had signed his recantation, extended in the flames, that it might be consumed before the rest of his body, exclaiming from time to time, "That unworthy hand." Consult Life by Todd (1801); Hook, 'Thomas Cranmer' in 'Lives of the Archbishops' (1868); Lingard, 'History of England,' Vol. V.; Froude, 'History of England,' Vols. I.–VI.; Green, 'History of the English People,' Vol. II. (1879); Mason, 'Thomas Cranmer' (1898).

Cran'nog, a fortified lake dwelling. The term is especially limited to the buildings in Ireland and Scotland because of its Gælic origin and is not used of the Swiss lake-dwellings. They date from the stone age, at least in theory, although it seems that most of those explored are certainly of historic time, and in some cases are as late as the 9th or 10th century. Of great archæological value are the refuse heaps near them. The Irish crannogs were first studied by Wilde in County Meath. Consult Munro, 'Ancient Scottish Lake-dwellings or Crannogs' (1882). See Lake Dwellings.

Cran'ston, Earl, American Methodist bishop: b. Athens, Ohio, 27 June 1840. He graduated at Ohio University 1861; served in the cavalry during the Civil War, rising to the rank of captain, 1862–4. He entered the Methodist Episcopal ministry, 1867; was publishing agent of the Church 1884–96, when he was elected a bishop. During 1898–1900 he visited China, Japan, and Korea in the discharge of his episcopal duties.

Cranston, R. I., a town in Providence County, on the New York, New Haven & Hartford Railroad. Cranston was originally a part of Providence, but was incorporated as a separate township in 1754. The villages that are included in the town are among the most prosperous in the State. The chief industry is the manufacture of cotton goods. The town is the site of the State prison, and of reform schools for boys and girls. Pop. (1900) 13,343.

Crantara, krăn'tă ra, a fiery cross which formed the rallying symbol in the Highlands of Scotland on any sudden emergency. The Highlanders appear to have borrowed it from the ancient Scandinavians, of whose use of it Olaus Magnus gives a particular account. As late as the insurrection in 1745 the crantara was circulated in Scotland, and on one occasion it passed through the district of Breadalbane, a tract of 32 miles, in three hours. After Charles Edward had marched into England, two of the king's frigates threatened the coast with a descent. The crantara was sent through the district of Appin by Alexander Stuart of Invernahyle (who related the circumstance to Sir Walter Scott), and in a few hours a sufficient force was collected to render the attempt of the English hopeless.

Crapaud (F. Crapaud, "toad"), **Jean, or Johnny**, a nickname applied to Frenchmen, as that of John Bull is similarly applied to Englishmen.

Crape, a light, transparent stuff, like gauze, made of raw silk, gummed and twisted on the mill, woven without crossing, and much used in mourning. Crapes are either craped (that is, crisped) or smooth. The silk destined for the first is more twisted than that for the second, it being the greater or less degree of twisting, especially of the warp, which produces the crisping given to it when taken out of the loom, steeped in clear water, and rubbed with a piece of wax for the purpose. Crapes are all dyed raw. This stuff came originally from Bologna, where tradition says it was made in the 7th century; but till of late years Lyons has had the chief manufacture of it. It is now manufactured in various parts of Great Britain. The crape brought from China is of a more substantial fabric. A woolen imitation is craped by machine rollers.

Crapelet, Charles, shärl krăp-ē-lā, French printer: b. Bourmont 13 Nov. 1762; d. Paris 19 Oct. 1809. He came to Paris at the time when great attention was beginning to be paid to the improvement of typography in finish and elegance. He practised his profession there for 20 years, and his editions are highly esteemed for their correctness. The most remarkable productions of his press are 12 copies, in letters of gold, of the *Oiseaux dorés* of Audibert.

Crapelet, Georges Adrien, zhôrzh ä-drē-ĕn, French printer and author: b. Paris 13 June 1789; d. Nizza 11 Dec. 1842. He maintained the reputation of his father, Charles Crapelet (q.v.), and the works which he published are esteemed for correctness and beauty of execution. Among them there are editions of La Fontaine, of Montesquieu, Voltaire, Rousseau, and Sismondi's 'Histoire des Français.' The idea of publishing a collection under the title of 'Anciens monuments de l'histoire de la langue Française' originated with him. He wrote an account of the progress of the art of printing in France and Italy in the 16th century, and its influence upon literature (8vo. 1836), and was the author of 'Souvenirs of London,' and of a history and description of that city, beside several translations from the English.

Crappie, krăp'ĭ, a widely distributed American sunfish (*Pomoxys annularis*) with a confusing number of local names, such as "bachelor," "Campbellite," "new-light," "tin-mouth," or "paper-mouth," etc., in the central Mississippi valley, and "sac-à-lait," and "chinquapin" in the Gulf States, where it is especially numerous. It is silvery olive in color, mottled with dark green on the upper part of the body, with vertical bars on the high fins. It may readily be

distinguished from the calico bass by the fact that its dorsal fin has not more than six spines. It will take a minnow-bait with the avidity of a black bass, but will not make so keen a fight. Its range has lately been very widely extended by the efforts of the United States Fish Commission. Consult: Jordan & Evermann, 'Food and Game Fishes of America' (1902). See SUNFISH.

Crash'aw, Richard, English poet: b. London 1616; d. 1649. He was educated at the Charterhouse and at Cambridge. In 1637 became a Fellow of Peterhouse, and having been admitted to orders, was noted as an eloquent and powerful preacher. In 1634 a volume of Latin poems, under the title of 'Epigrammata Sacra,' had been published anonymously by him at Cambridge. In 1644 he was ejected from his fellowship by the Parliamentarians, and proceeded to Paris, where he became a convert to the Roman Catholic faith. He was afterward a canon in the church of Loretto. A collection of poems by him, entitled 'Steps to the Temple, Sacred Poems, with other Delights of the Muses,' was published in 1646; and a posthumous volume 1652, 'Carmen Deo Nostro.' Gilfillan published some of Crashaw's poems in his edition of 'British Poets'; and an edition by Grosart was published in 1872.

Crassulaceæ, a natural order of plants, orpine family, which has 15 genera, and upward of 500 species, widely distributed throughout the world. They are herbs or shrubs, mostly fleshy or succulent. The best-known species of the family are the orpine or live-forever (*Sedum telephium*), and various stonecrops. The family is particularly rich in tropical species, which are known for the beauty of their flowers, and are cultivated in hothouses, and used for bedding out in warm dry locations.

Crass'us, Lucius Licinius, Roman orator: b. 140 B.C.; d. 91 B.C. He is introduced by Cicero, in his treatise 'De Oratore,' as the representative of that writer's own opinions on the subject of oratory. He was unfortunate as a legislator, inasmuch as the law proposed by him, to compel all who were not citizens to depart from Rome, was a main cause of the Social war. He was distinguished for his love of the arts; and his mansion upon the Palatium is cited, both for its architecture and for the statuary and paintings with which it was adorned, as having been one of the most noteworthy buildings in ancient Rome.

Crassus, Marcus Licinius, Roman triumvir, surnamed DIVES: b. about 115 B.C.; d. 53 B.C. When Sulla landed in Italy, 83 B.C., Crassus joined him and rendered him important services, for which he was rewarded with donations of confiscated property, besides being allowed to purchase confiscated estates at an almost nominal value. He was exceedingly fond of wealth, and also exceedingly skilful and by no means scrupulous in the ways and means of accumulating it. In 71 B.C. he was created prætor, and took the command against Spartacus and the revolted slaves. Spartacus was defeated and slain, along with a great number of his followers, and 6,000 captured slaves were crucified along the road between Rome and Capua. In 70 B.C. Crassus was elected consul, having Pompey as his colleague; was censor in 65 and with Cæsar and Pompey made up the first triumvirate in 55.

Cratægus, a genus of plants placed by American botanists in the apple family (*Pomaceæ*). The genus includes about 50 species, natives of the north temperate zone, Mexico, and the Andes of parts of Central America. The name is from the Greek, meaning "strong," and the plants are so called from the toughness of their wood. Twenty or more of the genus are found in North America. They are all large shrubs or small trees, more or less thorny; hence the name thorn, which is generally applied to them. The best-known American species is *C. crus-galli* or cockspur thorn, a shrub or small tree with a maximum height of 30 feet, the thorns numerous and slender, which blossoms in May and June in thickets from western Quebec westward to Manitoba and southward to Florida and Texas. The wood is heavy, weighing about 45 pounds to the cubic foot. The hawthorn, hedge-thorn, May-bush or quickset is *C. oxyacantha*. The scarlet thorn, haw or red haw, is *C. coccinea*. It is a small tree, reaching 30 feet high, growing in the same region as *C. crus-galli*. The wood is hard, of a reddish brown color and weighs about 53 pounds per cubic foot. The azaroles (*C. azarolus*), natives of the Levant, are occasionally cultivated for their fruit, which is about the size of the Siberian crab, and is used either for dessert or for pies. *C. orientalis* (or *odoratissima*) and *C. tanacetifolia* have also fruit of considerable size. The latter is much eaten in Armenia. *C. mexicana* has a large fruit, like a small apple, but not eatable. It is, however, very ornamental. The wood of most of the species much resembles that of the hawthorn. It is common to graft the rarer species on the hawthorn.

Crater (Gr. *κρατηρ*, a bowl), the opening on the tops or sides of volcanic mountains, through which the lava and ashes are ejected. The crater of Etna, like many of the most ancient volcanoes, does not retain the bowl-like shape to which the name owes its origin: that of Vesuvius, however, preserves the typical form. Variations in the form of the crater are due to varying violence of the eruption. The more powerful eruptions tear off the mountain top and produce the hollowed cup.

Crater, one of Ptolemy's northern constellations. It is sometimes considered a part of the constellation Hydra, and contains 35 stars visible to the naked eye, the three largest being of the fourth magnitude.

Crater Lake, a small lake in the Cascade Mountains, in Oregon, remarkable for its wall of perpendicular rock, from 1,000 to 2,000 feet high, a form due to volcanic action in geological times.

Craterus, krā'tē-rŭs, Macedonian general: d. 321 B.C. After the death of Alexander the Great, he received, together with Antipater, the government of Macedonia and Greece. He assisted Antipater in the Lamian war, and also against the Ætolians and Perdiccas, and fell in a battle against Eumenes.

Crates (krā'tēz) **of Athens**, Greek comic poet: flourished about 450 B.C., and contemporary with Cratinus. Eminent as an actor, he often performed the principal parts in the plays of Cratinus. As a comic poet he was the first Athenian who ventured to follow the example of Epicharmus so far as to bring drunken char-

acters on the stage. Aristotle in his 'Poetics' bears testimony to the excellence of his works. Little, however, is really known of them. Meineke, who has made a careful analysis of the statements of ancient writers on the subject, gives the titles of 14 ascribed to him. Fragments of eight of these are still extant.

Crates of Mallus, Greek grammarian; flourished about 150 B.C. He founded the celebrated Pergamene school of grammar, and became the great rival of Aristarchus, of the Alexandrian school. From his work on Homer, he is said to have been called 'Ομηριος. He wrote commentaries on Hesiod, Euripides, and Aristophanes. Only a few fragments of his works are preserved.

Crates of Thebes, Greek Cynic philosopher: flourished about 320 B.C. He was born at Thebes, but early removed to Athens, where he became the pupil of Diogenes, and afterward one of the most eminent in that school of philosophers. According to Diogenes Laertius, he lived a Cynic of the straitest sort. Fearing that the quiet of philosophical pursuits would be disturbed by the cares of wealth, of which he had an abundance, he is said to have thrown his money into the sea; or, according to another account, to have placed it in the hands of a banker, with the condition that if his sons should have the misfortune to be fools, they should inherit the property, and that otherwise it should be distributed to the poor. "For," said Crates, "if they are philosophers, they will not need it."

Cratinus, krą-tī'nŭs, Greek comic poet: b. about 520 B.C.; d. 422 B.C. The 'Archilochoi,' supposed to have been his earliest production, was not exhibited till he was upward of 70 years of age; but he lived to achieve much for his profession, and at the advanced age of 97 died at the height of his fame, having just triumphed over Aristophanes himself. He found the Greek comedy a mere plaything, employed to excite merriment and laughter, and at once converted it into a terrible weapon for the chastisement of public and private vice. Horace particularly commends the public spirit and the impartial justice with which he exercised his censorship over the morals of his age. The uniform testimony of ancient writers places Cratinus in the first rank as a comic poet. His great rival, Aristophanes, was fully aware of his power. In the 'Knights' he compares him to a torrent carrying everything before it. According to the best authorities he wrote but 21 dramas, 9 of which were successful in the Dionysiac contest. Not a single one of his dramas is now extant; only a few fragments remain to attest the excellence of his admired productions.

Cratinus, Greek poet of the middle comedy, contemporary with Plato, the philosopher, and sometimes confounded with his elder and more celebrated namesake preceding. Eight plays are ascribed to him.

Cratippus, kra-tĭp'us, Greek historian, contemporary with Thucydides. He continued the work of the great historian, and brought it down, according to Plutarch, to the time of Conon. The well-known words of Dionysius: "He wrote what Thucydides left unwritten," evidently show that Cratippus not only continued the history of Thucydides, but also supplied whatever omissions he thought he found in it.

Cratippus, Greek Peripatetic philosopher: b. Mitylene about 75 B.C. He appears to have been held in the highest estimation by the great men of his age. Cicero calls him the prince of all the philosophers whom he had known. Pompey visited him after his defeat at Pharsalia, and received at his hands the consolations of philosophy; and Brutus went to Athens, to which city Cratippus had latterly betaken himself, to listen to his prelections, even while making preparations to meet Octavius and Antony. Nothing that he wrote has survived.

Cravat (Fr. "a Croatian," see below), a neckcloth or tie worn about the collar. The ancients left the neck unconfined, only wrapping it in case of sickness. The earliest necktie was a small cord fastening the collar, a starched band of fine linen attached to the shirt. With the introduction of ruffs these ties went out. The modern form of the cravat dates from 1600, when a regiment of Croats (or Cravates, as the French called them) came to France wearing a bandage about the neck, consisting of common stuff for the soldiers, and of muslin or silk for the officers, with the ends disposed in a bow, or garnished with a tuft or a tassel, and hung over the breast. The fashion was taken up and the military and the rich wore fine cravats, with the border embroidered or edged with broad lace. Those of the soldiers consisted of a scrap of cloth, of cotton, or, at the best, of black, plaited taffeta, bound round the neck by two small cords. Afterward the place of these cords was supplied by clasps or a buckle, and then cravats took the name of stocks. Under Louis XVI. the stocks yielded to the cravats *à la chancelière*. The last flourished but for a moment; the Revolution came, and with it disappeared cravats and even tight breeches.

Soon after this epoch (1796) the cravat recovered its popularity, and increased to an incredible degree of extravagance. Some persons enveloped the neck with whole pieces of muslin; others with a padded cushion, on which were wrapped numerous folds. In this way the neck was puffed out so as to be larger than the head, with which it was imperceptibly confounded. The shirt collar arose above the ears, and the upper edge of the cravat buried up the chin and the mouth nose-deep; so that it was impossible to incline the head in any direction. This fashion of wearing voluminous cravats lasted for a considerable time, but common sense at last brought in the simpler style of neckties that has since prevailed.

Craven, Alfred Wingate, American civil engineer: b. Washington, D. C., 20 Oct. 1810; d. Chiswick, Eng., 29 March 1879. He was graduated at Columbia College in 1829, and was largely employed in railroad construction and management. His most important work was in New York, in connection with its sewerage, its supply of Croton water, and the improvement of Fourth Avenue. From the organization of the Croton water board, in 1849, till 1868, he was its engineer, and planned and supervised the construction of the great works of that period. He was a founder, director many years, and president, 1860–71, of the American Society of Civil Engineers.

Craven, Charles, English colonial officer. He was governor of South Carolina from 1712 to 1716, and had been previously secretary to the proprietors. They ordered him in 1712 to sound Port Royal River, and probably he built Beaufort soon afterward. In 1715, on the occurrence of an Indian war, he displayed great vigor and talent, and expelled from the province the invading savages.

Craven, Elijah Richardson, American Presbyterian clergyman: b. Washington, D. C., 28 March 1824. He graduated at Princeton 1842, and from its Theological Seminary 1848. Ordained in the Presbyterian ministry 1850, he held pastorates at Somerville and Newark, N. J., 1850–87, when he became secretary of the Presbyterian Board of Publication and Sabbath-school Work. He was the American editor of Lange's 'Commentary on the Book of Revelation.'

Craven, Pauline de la Ferronays (Madame Augustus), French novelist: b. Paris 1820; d. there 1 April 1891. Her 'Family Memoirs'; 'The Story of a Sister'; 'The Labor of a Soul'; and other fictions are as well known in English translations as in their original French.

Craven, Thomas Tingey, American naval officer: b. Washington, D. C., 30 Dec. 1808; d. Boston, Mass., 23 Aug. 1887. He joined the navy in 1822; was promoted captain in June 1861, and the same year was given command of the Brooklyn, with which vessel he took part in the capture of New Orleans and the later actions on the Mississippi. In 1862 he was placed in command of the Niagara, and during the remainder of the war he served along the coasts of England and France. He was promoted rear-admiral in October 1866; retired in December 1869.

Craven, Tunis Augustus Macdonough, American naval officer: b. Portsmouth, N. H., 11 Jan. 1813; d. 5 Aug. 1864. He entered the navy in 1829; in 1857 surveyed the isthmus of Darien; coasted about Cuba to intercept slave ships; and in the Civil War had part in preventing the capture of the fort on Key West. Given the rank of commander he joined Farragut's fleet off Mobile, commanding the monitor Tecumseh. In the battle of Mobile Bay the Tecumseh was sunk by running upon a torpedo, and Craven and almost all his crew lost their lives.

Crawfish. See Crayfish.

Crawford, Francis Marion, American novelist: b. Bagni di Lucca, Italy, 2 Aug. 1854, his father being Thomas Crawford the sculptor (q.v.). He was educated at Trinity College, Cambridge, and afterward studied Sanskrit and other subjects on the European continent. In 1879–80 he was editor of the 'Allahabad *Indian Herald*' and for nearly 20 years subsequently resided mainly in Italy. His novels and other writings include: 'Mr. Isaacs' (1882); 'Doctor Claudius' (1883); 'A Roman Singer' (1884); 'An American Politician' (1884); 'Zoroaster' (1885); 'A Tale of a Lonely Parish' (1886); 'Marzio's Crucifix' (1887); 'Saracinesca' (1887); 'Paul Patoff' (1887); 'With the Immortals' (1888); 'Greifenstein' (1889); 'Sant' Ilario' (1889); 'A Cigarette-maker's Romance' (1890); 'The Witch of Prague' (1891); 'Khaled' (1891); 'The Three Fates' (1892); 'The Children of the King' (1892); 'Don Orsino' (1892); 'Marion Darche' (1893); 'Pietro Ghisleri' (1893); 'The Novel: What Is It?' (1893); 'Katharine Lauderdale' (1894); 'Love in Idleness' (1894); 'The Ralstons' (1895); 'Constantinople' (1895); 'Casa Braccio' (1895); 'Taquisara' (1896); 'A Rose of Yesterday' (1897); 'Corleone' (1897); 'Ave, Roma Immortalis' (1898); 'In the Palace of the King' (1898); 'Via Crucis' (1899); 'The Rulers of the South' (1900); 'Marietta' (1901); 'Cecilia' (1902); 'Man Overboard' (1903). As a novelist Crawford is characterized by excellence in the depicting of character and general carefulness in the handling and collection of his materials. Several of his novels have been translated into German, and he himself produced French versions of 'Zoroaster' and 'Marzio's Crucifix.' In recognition of his merits as a writer the French Academy bestowed on him the Monbrun prize and a gold medal.

Crawford, George Washington, American lawyer: b. Columbia County, Ga., 22 Dec. 1798; d. 22 July 1872. He was graduated at Princeton 1820; was attorney-general of Georgia 1827–31; a member of the State legislature 1837–42; and Whig representative in Congress 1843. He was elected governor of Georgia 1843, and re-elected 1845. He was secretary of war in President Taylor's cabinet 1849–50, resigning upon the death of the President.

Crawford, Isabella Valency, Canadian poet: b. Dublin, Ireland, 1851; d. 1887. She was a well-known Canadian writer, and furnished many stories for American publications. In 1884 she published a collection of poems highly commended by critics.

Crawford, John Martin, American physician: b. Herrick, Pa., 18 Oct. 1845. He was graduated at Lafayette College 1871, and at Pulte Medical College, Cincinnati, 1878, where he became professor of physiology and physical diagnosis 1881–9. From 1889 to 1894 he was United States consul-general to Russia, and while there made the first complete English translation of the Finnish epic poem 'The Kalevala' (1888). He also edited and translated a five-volume work on 'The Industries of Russia.'

Crawford, Mary Caroline, American author: b. Boston, Mass., 5 May 1874. She was educated at Radcliffe College, and besides contributing editorially and otherwise to various New York and Boston journals, was literary editor of the 'Boston Budget' 1898–1902. She has published 'The Romance of Old New England Roof Trees' (1902); 'The Romance of Old New England Churches' (1903).

Crawford, Nathaniel Macon, American Baptist clergyman: b. near Lexington, Ga., 22 March 1811; d. near Atlanta, Ga., 27 Oct. 1871. He was graduated at the University of Georgia in 1829; was professor of mathematics in Oglethorpe University, Ga., 1837–41, and was ordained to the Baptist ministry in 1844. He was professor of biblical literature in Mercer University, Ga., 1847–54; president 1854; and professor in the Western Baptist Theological Seminary at Georgetown, Ky., 1857–8, when he resumed the presidency of Mercer University. Besides some minor works on the tenets of his Church he wrote 'Christian Paradoxes' (1858).

Crawford, Thomas, American sculptor: b. New York 22 March 1814; d. London, Eng., 16 Oct. 1857. His most famous works comprise 'Orpheus and Cerberus'; 'Adam and Eve'; 'Hebe and Ganymede'; 'Mercury and Psyche'; and 'Dancing Jenny.' His statue of the 'Genius of America' is placed on the dome of the capitol at Washington, and for the State of Virginia he made the equestrian statue of Washington, at Richmond.

Crawford, William, American soldier: b. Berkeley County, Va., 1732; d. Wyandot County, Ohio, 11 June 1782. He was a surveyor by profession, and an associate of Washington, who trusted him greatly. He served with the Virginia riflemen through Braddock's campaign; was promoted captain on Washington's recommendation in 1761, and served through the Pontiac war 1763–4. When the Revolution broke out he joined Washington with a company of Virginians; was at the battles of Long Island, Trenton, and Princeton; on frontier duty 1778; and was colonel when he resigned in 1781. In May 1782, at Washington's request, he commanded an expedition against the Wyandot and Delaware Indians on the Sandusky River. They met the Indians 4 June, and in the engagement which followed Crawford was captured and subsequently tortured by his captors before being burned at the stake. Consult Roosevelt, 'Winning of the West' (Vol. II., 1889); Butterfield, 'Expedition Against Sandusky' (1873).

Crawford, William Harris, American statesman: b. Amherst County, Va., 24 Feb. 1772; d. Albert County, Ga., 15 Sept. 1834. In 1783 he settled in Georgia, was admitted to the bar in 1798, and entered on practice in Lexington. He was elected to the State senate in 1802, and to the United States Senate to fill a vacancy in 1807 (fighting two duels during the canvass); was re-elected for a full term in 1811; was chosen president of the Senate pro tem. in 1812; and, refusing the secretaryship of war, was appointed minister to France in 1813. Two years later he became secretary of war, and the next year secretary of the treasury, and held the latter office till March 1825. He was urged as a candidate for the presidency several times, received the nomination in 1824, and in the election had 41 electoral votes. No choice for President having been reached, the election was decided in the House of Representatives, but meanwhile Crawford had been stricken with paralysis, which precluded his effectual candidacy.

Crawford, William Henry, American educator: b. Wilton Centre, Ill., 1855. He was graduated at Northwestern University 1884, and from Garrett Biblical Institute. After five years' pastoral work in the Methodist ministry he became professor of the history of theology in Gammon Theological Seminary 1889–93. In 1893 he was elected president of Allegheny College, Meadville, Pa. He was one of the judges to select the names for the Hall of Fame in New York.

Crawford Notch, the picturesque pass in the White Mountains, New Hampshire, between Mounts Webster and Wiley, which rise about 2,000 feet above the Saco River, which flows through the Notch.

Crawfordsville, Ind., city and county-seat of Montgomery County, on Sugar Creek, and the Chicago, Cleveland, Cincinnati & St. Louis and the Vandalia and Monon Route railroads; 44 miles west of Indianapolis. It is the trade centre of an extensive agricultural region, with annual dealings of $3,500,000. It is the seat of Wabash College, and has foundries, planing- and flour-mills, electric lights, waterworks, high school, daily and weekly newspapers, two national banks, and an assessed property valuation of $5,000,000. Pop. (1900) 6,049.

Crawfurd, Oswald, English novelist. He was the son of a former English envoy to Siam, and governor of Singapore, and was educated at Eton and Oxford. After serving as a clerk in the Foreign Office he was English consul at Oporto, Portugal, 1867–91. He has published: 'Travels in Portugal, by John Latouche', 'Round the Calendar in Portugal'; 'Portugal: Old and New'; 'British Comic Dramatists'; 'Lyrical Verse from Elizabeth to Victoria'; 'Four Poets' (1890); 'Two Masques,' a book of verse; and the novels, 'The World We Live In'; 'Beyond the Seas'; 'Sylvia Arden'; 'The New Order.'

Crawshaw, krâ'shâ, **William Henry,** American educator: b. Newburg, N. Y., 6 Nov. 1801. He was graduated at Colgate University, Hamilton, N. Y., 1887, and was elected professor of English literature there the same year. Since 1897 he has also been dean of the college faculty. He has published: 'The Interpretation of Literature' (1896), 'The Literary Interpretation of Life' (1900); and an edition of Dryden's 'Palamon and Arcite' (1898).

Crayer, krī'yėr, **Gaspar,** Dutch painter: b. Antwerp 1582; d. 1660. He was a pupil of Raphael Coxis, and became, by the study of nature, one of the greatest historical and portrait painters. At the Spanish court in Brussels he painted the portrait of the Cardinal Ferdinand, brother of the king, and received a pension. He established himself in Ghent, where he constantly executed works for the court, laboring with industry and perseverance till his 86th year. The city of Ghent alone had 21 altar-pieces by him. In Flanders and Brabant are many of his works, and some of his pictures are in the public collections at Vienna and Munich. His paintings are praised for fidelity to nature, excellent drawings, and a coloring approaching the manner of Vandyke.

Crayfish, or **Crawfish** (Fr. *écrevisse*, so not connected with "fish"), a fresh water crustacean of the family *Astacidæ*, order *Decapoda*. They are known by their large size, lobster-like shape, the abdomen being as long as the cephalothorax, and ending in a broad tail-fin. The first pair of legs end in large claws (chelæ), not so large in proportion as those of the lobster, and those of each leg are nearly equal in size. Crayfish attain a length of three to six inches, and live in streams or ditches, sometimes abounding in great numbers. They dig holes in the banks, from a few inches to a yard in depth, probably, like the lobster, using their big claws for this purpose. They lie at the mouth of their burrow with their claws extended ready to seize any passing insects, snails, tadpoles, or frogs, and sometimes larger animals, and, like the lobster, they will not refuse carrion, and occasionally feed on succulent roots. The European crayfish spawns in the early spring, the eggs hatching

in May and June. As in all fresh-water crustacea the young are hatched in the form of the parent, there being no metamorphosis,— in other words, development is direct. As in the lobster, if an antenna or leg is lost it is gradually renewed, growing at every molt. For some time after they are hatched the young adhere by the hooked end of their claws to the swimmerets of the mother, and are carried about under cover of her abdomen. During this period the young crayfish are very sluggish, and take no food, being nourished by the food-yolk still persisting in the front part of the body. The European crayfish molts eight times in the course of the first year, and five times during its second year; in the third year only twice, that is, in July and September. At a greater age than this the females molt only once and the males twice a year.

The crayfish of the Old World belong to the genus *Astacus*, while those of North America east of the Sierra Nevada belong to the genus *Cambarus*, the latter differing by the absence of gills on the fifth or last pair of legs. An interesting feature in geographical distribution is the occurrence of half a dozen species of the European genus *Astacus* in the streams draining the Pacific coast from British Columbia to California. East of the Rocky Mountains, from the Great Lakes to Guatemala, there occur between 30 and 40 species of *Cambarus*. These extend to eastern New York west of the Hudson River, and a single species (*C. bartoni*) occurs under stones in certain lakes of northern Maine as also in Lake Champlain and the Great Lakes, extending southward to Kentucky and the District of Columbia.

The presence of the Eurasian *Astacus* on the Pacific coast indicates their gradual migration from eastern Asia, at a time when Bering Strait was dry land. In certain characters the Amurland and Japanese *Astaci* differ from the Pontocaspian and the west American *Astaci* and approach the *Cambari* of eastern North America. This is also paralleled in the distribution of many plants and insects.

The family to which the crayfish belongs dates as far back as the Jurassic Period, and in Europe *Astaci* first appear in the Upper Cretacean. In North America fossil *Astaci* (*Cambarus primæves*) occur in the Lower Tertiary beds of the western border of Wyoming. Cope discovered fossil *Astaci* in the late Pliocene beds of Idaho. *Astacus* probably originated in western America, since it is found fossil throughout the Tertiary.

Crayfishes are of no little economic importance from the fact that in the course of their extensive fossorial operations they undermine dams, and it is supposed that the inundations of the Mississippi River and the breaks in the levees may be due largely to the mining habits of these animals. For the blind crayfish see CAVE-DWELLING ANIMALS. Consult: Huxley, 'The Crayfish' (1880); Hagen, 'Monograph of the North American Astacidæ' in the 'Illustrated Catalogue of the Museum of Comparative Zoology,' No. III., Cambridge 1870, and for habits and uses, Rathbun, 'Fishing Industries of the United States' (1884).

Crayon, Geoffrey, a pseudonym of Washington Irving.

Crayon, a colored pencil consisting of a cylinder of fine pipe-clay colored with a pigment. Black crayons are colored with plumbago, or made of Italian black chalk. A white crayon is a cylinder of chalk, common in Europe and America. Red chalk is found in France. The holder is a porte-crayon. Crayons are said to have been made in France in 1422. It is hard to say how long ago charcoal, chalk, and ocherous earths were used. Colored crayons are used for pastel-drawing and are quicker and softer in effect than oils or water colors. Their disadvantage lies in their delicacy; they smudge so easily that it is practically impossible to use them for sketching, and they must be kept under glass.

In lithography a crayon is a composition formed as a pencil, and used for drawing upon lithographic stones. It is of a soapy nature, consisting of soap, wax, resins, and lampblack, melted, and sometimes burned, together.

Crazy-weed, a common name in the prairie States for a species of vetch (*Astragalus mollissimus*) of the pea family. It is an herb with purple or yellowish purple flowers, growing on the prairies from Nebraska and Colorado southward to Texas and New Mexico. It receives its name of crazy-weed from the effect it has upon cattle when eaten by them. Another common name is loco-weed, from which arises a local term for an insanely acting person, who is said to be locoed. The same common names are applied to *Spiesia Lamberti*, which grows northward from Minnesota to British Columbia, and south through Texas and New Mexico.

Cream. See DAIRY INDUSTRY.

Cream Nut. See BRAZIL NUT.

Cream of Tartar, a white, crystalline compound of tartaric acid (q.v.) and potassium. Tartaric acid is dibasic, its molecule containing two atoms of hydrogen that are replaceable by metals. Cream of tartar is the substance that is formed when only one of these typical hydrogen atoms is replaced by potassium; and it is therefore known to chemists as hydrogen potassium tartrate, or acid potassium tartrate, to distinguish it from the normal potassium tartrate, in which both of the typical hydrogen atoms of the acid are replaced by potassium. Cream of tartar is obtained from argol (q.v.), which forms about vats or casks in which wine is undergoing fermentation. The argol is dissolved in hot water, and the solution decolorized by albumin or animal charcoal, the cream of tartar being then extracted by evaporation and crystallization, and purified by recrystallization. Cream of tartar is soluble in water, but it does not dissolve as freely as the other familiar compounds of potassium. It constitutes the chief commercial source of tartaric acid and its compounds, and is used in medicine to some extent. The best baking powders consist of cream of tartar, mixed with sodium bicarbonate in the proportion of the relative molecular weights of the two substances. These salts do not act upon each other when dry, but when they are moistened they combine to produce the normal tartrate of potassium and sodium, with the formation of water and the liberation of carbon dioxid gas. The formula of cream of tartar is $KH_5C_4O_6$, and that of sodium bicarbonate is $HNaCO_3$. The reaction that oc-

curs is represented by the equation $HNaCO_3 + KHC_4O_6 + H_2O = CO_2 + KNaHC_4O_6$, the last formula on the right being that of the normal tartrate of sodium and potassium. The carbon dioxid gas that is liberated in the reaction is retained by the dough or batter with which the baking powder is mixed, and serves to make it porous, or light.'

Creameries, Co-operative. See DAIRY INDUSTRY.

Creamery. See DAIRY INDUSTRY.

Creasote, a variant spelling of creosote (q.v.).

Creasy, Sir Edward Shepherd, English historian; b. Bexley, Kent, 12 Sept. 1812; d. London, 27 Jan. 1878. He was educated at Eton, and Cambridge. He was called to the bar at Lincoln's Inn in 1837, and was for about 20 years a member of the home circuit. In 1840 he was appointed professor of history at the London University, and in 1860 was knighted and made chief justice of Ceylon. His principal works are: 'The Rise and Progress of the British Constitution' (1834); 'The Fifteen Decisive Battles of the World' (1851), a book famous in both England and America. Less known, though still of considerable merit, are his 'Imperial and Colonial Constitutions of the Britannic Empire'; a 'History of the Ottoman Turks' (1854–6); a 'Historical and Critical Account of the Several Invasions of England'; 'The Old Love and the New,' a novel; and a 'History of England' (1869–70).

Creatine, krē'a-tīn, or **Kreatine,** a crystalline, nitrogenous substance having the formula $C_4H_9N_3O_2 + H_2O$, and known to chemists as "methyl-guanido-acetic acid." It exists in the muscular flesh of mammals, birds, reptiles, and fishes, and also, in smaller quantities, in brain-tissue, and in urine. It may be extracted by chopping up lean muscular flesh (freed from fat), rubbing it with water at about 140° F., and removing the water by pressure. The liquid so obtained is heated on a water bath to coagulate the albumin, and then strained. Sub-acetate of lead is added to the filtrate so long as it gives a precipitate, excess of lead is removed by sulphuretted hydrogen, and the filtrate is concentrated on a water bath. Crystals of creatine then separate out, the yield being larger if two or three volumes of alcohol are added. The crystals are redissolved, decolorized by filtration through animal charcoal, and purified by re-crystallization. Creatine crystallizes in monoclinic prisms, containing one molecule of water. Its aqueous solution has a bitter taste, and is neutral to litmus. With silver nitrate it gives a white precipitate, which is soluble in caustic potash. If a small quantity of silver nitrate is added to a saturated solution of creatine, together with just sufficient caustic potash to dissolve the precipitate formed, the solution presently solidifies to a transparent gelatinous mass, which, when heated, deposits metallic silver. Creatine is dissolved by strong acids, losing one molecule of water, and becoming converted into creatinine. It is also decomposed by boiling with baryta water, yielding sarcosine ($C_3H_7NO_2$) and urea (CH_4N_2O). Creatine may be prepared synthetically by allowing an alcoholic or aqueous solution of sarcosine and cyanamide, $C(NH)_2$, to evaporate spontaneously, crystals of creatine separating out as the evaporation proceeds. See also CREATININE.

Creatinine, or **Kreatinine,** a crystalline substance having the chemical formula $C_4H_7N_3O$, and closely allied to creatine (q.v.), from which substance it may be obtained by the removal of one molecule of water by the action of mineral acids or dehydrating agents. It may also be prepared directly from human urine, though, according to Johnson, slight differences exist between the substances obtained from creatine and from urine; for example, both reduce Fehling's solution, but the creatinine prepared directly from urine has a reducing power about 20 per cent greater than that prepared from creatine. Differences in solubility are also said to exist. Creatinine crystallizes in prisms, which may be anhydrous, or may contain two molecules of water. It is very soluble in hot water, its solution being neutral to litmus according to some authorities, but alkaline according to others. It forms well-crystallized salts with acids, and in alkaline solution it slowly takes up water and becomes transformed into creatine. Physiologically, creatinine is to be regarded as a derivative from creatine; for, according to Carpenter, "the latter predominates in the juice of flesh, almost to the exclusion of the former, while the former predominates in the urine, almost to the exclusion of the latter."

Creation (Lat. *creatio*, from *creare*, to create), **The.** Creation is the act of creating or bringing into existence, also something created or caused to exist; specifically the act of bringing into existence the universe, likewise the universe itself. The Old Testament account of the creation contained in Genesis i.–ii. 4 (first clause) is received by those who accept the literal authority of the Bible. Genesis ii. 4–7 (second clause) contains, according to many of the later biblical critics, another and quite distinct narrative of the creation. According to the first and generally accepted account, God created the heaven and the earth in the course of six — or, including the rest-day, seven — successive days. On the first day he created light, and called the light day and the darkness night; on the second day he made the firmament and divided the waters; on the third day appeared the dry land, while the waters were gathered together in seas, and plants began to grow upon the earth; on the fourth day the lights were set in the firmament; on the fifth day God created aquatic and bird life; on the sixth day he made land animals and created man. On the seventh day God rested from his work, and from this part of the account came the institution of the Sabbath, as having been hallowed for man by the example and decree of God himself. Various attempts have been made to bring this narrative into harmony with the discoveries and speculations of modern scientific and philosophical thought; but at the present time there appears to be a feeling, as well among scholars as among people at large, that such endeavors can only be unprofitable; while the record of primitive theorizing upon the origin of the world may well be left to tell its own story, however variously interpreted, to the modern mind.

Other ancient cosmogonies have long engaged the attention of students, and in the different early accounts of creation brought to light from

the literary and monumental remains of antiquity much valuable material has been found for the study of comparative records bearing upon history and religion. Among the old cosmogonies, that contained in the Babylonian and Assyrian legend of creation is especially interesting, from the points of resemblance between itself and the account above given from the book of Genesis. The two are variously regarded by specialists, some treating them as independent variants of one original tradition or myth, while others hold that the narrative of Genesis is a borrowing from the Babylonian legend.

It is now more than 30 years since the learned world was startled by the announcement that Assyriologists had discovered a remarkable version of the history of the creation, which closely resembled the main narrative of Genesis, and appeared to be based upon the archetype from which one of the earliest editors or writers of the Hexateuch drew many of his statements. The credit of the discovery of the cuneiform creation records in the British Museum belongs, undoubtedly, to Sir Henry Rawlinson. L. W. King, of the British Museum, has continued and completed, as far as is possible, up to the present time, the work begun by Rawlinson. As the result of his labors we are able to form a connected idea of the whole of the Babylonian story of the creation. Formerly only 21 tablets and fragments inscribed with portions of the legend were known, but now no less than 49 separate tablets and fragments have been identified as containing portions of the cuneiform texts of the creation series, and the details of the story can now be followed consecutively.

The great Babylonian poem of creation was divided into seven sections, or tablets, and the whole work was known by the title 'Enuma Elish,' which also forms the opening words of the text. It contained 994 lines. Each of the seven sections contained, on an average, 140 lines, and each section was intended to describe the events of one "day" of creation. It is difficult not to think that such artificial divisions of the legend indicate that we are dealing with a comparatively late recension of it, and this may well be the case when we remember that the oldest copies of it which we possess date from the reign of Assurbanipal (668–626 B.C.); no one who takes the trouble to read the seven tablets and who is familiar with ancient cosmogonies and theogonies will have the slightest doubt that the original form of the Babylonian and Assyrian history of creation is many thousands of years old. It is very probable that the Semitic Babylonians were only the borrowers and not the inventors of this remarkable work.

At the beginning of all things, according to the legend, Apsu and Tiamat were water deities and typified chaos; to these were born Lahmu and Lahamu, and later appeared Anshar and Kishar, and still later Anu and other gods came into being. One of the fragments of the first tablet mentions the birth of Nudimmud (Ea), and shows that Marduk, who is made to take the leading part in the later tablets of creation, was supposed to be in existence, like Mummu and Gaga. In the earlier episodes of the creation story, it is Ea and not Marduk who is the hero, and it was Apsu, a god of chaos, who rebelled against the gods. Apsu disliked the new order of things and the creation of the universe for the simple reason that the beings who formed members of the new world disturbed his peace and rest; as soon as he had made up his mind as to what was likely to happen, he called Mummu, his minister, and with him went to Tiamat and took counsel with her, and complained that "he could get rest neither by day nor by night." The putting of the house of the world into order by the gods destroyed his peace of mind. Of the conflict which took place between Ea and Apsu and his ally Mummu we know little, but that the great god did not succeed in inflicting a decisive defeat on Apsu and his allies is clear from the fact that, later, Anshar found it necessary to exhort Marduk to do battle with Tiamat. Marduk slew her, and split her body into halves. The actual account of the creation of the world by Marduk begins toward the end of the fourth tablet, where it is said that one half of the body of Tiamat formed a covering for heaven, and that Marduk, having formed E-shara, made the great trinity of Anu, Bel, and Ea to dwell therein.

In the fifth tablet we hear of the fixing of the constellations of the zodiac, the founding of the year, etc., and it seems as if this section contained an account of the creation of vegetation. The sixth tablet told the story of the creation of man, and it seems as if Marduk made man with the view both of punishing the gods and of providing a creature who should at all times worship him. Marduk, or Bel, instructed Ea to cut off his (Marduk's) head, and the man was formed out of the blood which flowed from the god's body. Marduk is made to tell Ea that he intends to create man from his own blood and from the "bone" which he will create. The Assyrian word for "bone" is *issimtu*, which is the exact equivalent of the Hebrew *'esem*, "bone," which occurs in Genesis ii. 23, in connection with the account of the creation of woman.

The creation of man was the final act of creation, and when this was accomplished, the gods assembled in their council chamber in Upshukkinaku, with Marduk at their head, and they sang to him a hymn of praise, the text of which forms the seventh section of the creation story and contains 50 addresses to the god. How Marduk managed to survive his decapitation is not told us, and we can only surmise that he met the gods in their council chamber in some sort of spiritual body. The parallels which may be drawn between parts of this legend and the book of Genesis are taken by many scholars to prove that the Jews borrowed large portions of their religious literature from their kinsmen, the Babylonians, and that the seven days of creation were imagined long before the days of Abraham. Consult: Smith, 'Assyrian Discoveries'; 'The Chaldæan Account of Genesis'; Sayce, 'Fresh Light from the Ancient Monuments'; Jastrow, 'Religion of Babylonia and Assyria'; Jensen, 'Die Kosmologie der Babylonier'; Delitzsch, 'Babel und Bibel' (1903).

Creation, Natural History of, a book by Ernst Heinrich Haeckel (q.v.), published in 1868. It is a brilliant exposition of evolution theories in their most extreme form. Darwin said of it: "If this work had appeared before my essay had been written, I should probably never have completed it." The acceptance of the work is shown by eight editions of the German original within 10 years, and translation into 12 languages.

Creation, The Story of, a book with the subtitle, 'A Plain Account of Evolution,' by Edward Clodd (q.v.). It is an instructive study of what evolution means, and how it has been supposed to have operated in the upward development from the lowest level of the two kingdoms of living things, animals and plants. The book is especially adapted to popular reading. In another work of the same general character, 'The Childhood of the World: A Simple Account of Man in Early Times,' Mr. Clodd has in a most interesting manner dealt with the latest stage of the evolutionary creation, showing how the theory is supposed to explain the origin and early history of the human species. A third volume, on the same plan of popular exposition, 'The Childhood of Religions,' covers the ground of the earliest development of man in a spiritual direction, and especially explains the origin and growth of myths and legends.

Creationism. (1) In theology, the doctrine that a soul is specially created for each human fœtus as soon as it is formed in the womb; opposed to Traducianism (q.v.), which teaches that the souls of children as well as their bodies are begotten by reproduction from the substance of the parents; and to Infusionism (q.v.), which holds that souls are pre-existent, and that a soul is divinely infused into each human fœtus as soon as it is formed by generation. Many theologians, however, regard the mode of the soul's coming into being as a part of the mystery which envelops the whole subject of the existence and transmission of life; (2) a term for that theory of the origin of man which is opposed to evolutionism (see Evolution); the doctrine of the creation of all things by the Creator's fiat, and not through evolutionary processes.

Crébillon, Claude Prosper Jolyot de, klōd prōs-pār zhōl-yō dė krā-bė-yoṅ, French novelist: b. Paris 14 Feb. 1707; d. there 12 April 1777. He was the younger son of Prosper Jolyot de Crébillon (q.v.), and succeeded as an author in an age of licentiousness. By the subtleties with which he excuses licentious principles, Crébillon contributed to diffuse a general corruption of manners, before confined to the higher circles of Parisian society. His own morals, however, appear to have been the opposite of those which he portrayed, and we are told of his cheerfulness, his rectitude of principle, and his blameless life. Of his works the best are: 'Lettres de la Marquise' (1732); 'Tanzaï et Néadarné' (less licentious, but full of now unintelligible allusions); 'Les Egarements du Cœur et de l'Esprit' (1736); 'Le Sopha' (1745). It is still a disputed point whether he was the author of the 'Lettres de la Marquise de Pompadour.'

Crébillon, Prosper Jolyot de, French dramatist: b. Dijon, France, 15 Feb. 1674; d. Paris 17 June 1762. His first piece, 'La Mort des Enfants de Brute,' was rejected by the players. He burned the manuscript, and resolved to have no more to do with the drama; but subsequently wrote 'Idoménée,' which, in 1705, was brought upon the stage. The faults of the play were overlooked in consideration of the youth of the author and the promising talent which it displayed, and his talents, after the appearance of his 'Atrée,' in 1707, were loudly applauded. A taste for unnatural declamation had been excited by Corneille's tragedy, 'Rodogune,' and this manner was carried to excess by Crébillon in the 'Atrée.' In 1709 appeared his 'Electre,' which is as declamatory and as intricate as his earlier plays; yet it suited the taste of the age. His *chef-d'œuvre*, at least according to La Harpe, is his 'Rhadamiste' (1711). In eight days the 'Rhadamiste' passed through two editions, and Paris and Versailles vied with each other in admiring it. Crébillon had been told that his talent lay in the terrible, and thought, therefore, that he could not exert himself too much in scenes of horror. 'Xerxes' (1714) exceeded in this respect all that he had before written, but soon disappeared from the stage. 'Semiramis' (1717) was severely censured, but 'Pyrrhus' appeared in 1726, and met with a good reception, contrary to the expectation of the author, who, in this work, had abstained from the frightful and shocking.

When Madame de Pompadour wished to humble Voltaire, Crébillon was thought of as a fit instrument for her purpose. The king gave him the office of censor of the police, a yearly pension of 1,000 francs, and an appointment in the library. Thus freed from pecuniary anxiety, he finished his 'Catiline,' which was represented in 1749 with all the pomp that the court theatre could display. To make some atonement to the character of Cicero, thought to have been wronged in his 'Catiline,' he wrote at 76 the 'Triumvirate, or the Death of Cicero,' which was brought upon the stage in his 81st year. The defects of this piece were overlooked, from respect to the age of the author. In general Crébillon shows none of the true elevation of the tragic art, but only an imitation, sometimes a happy one, of the manner struck out by Corneille. He was a man of a proud and independent character, disdained to flatter the great, and passed much of his life in a condition bordering on poverty. In 1731 he became a member of the Academy. Consult Dutrait, 'Etude sur Crébillon' (1895).

Crèche, krāsh (Fr. "crib," "manger"), a sort of public nursery where, for a small payment or, as in America, usually for nothing, the children of women who have to go out to work are fed, nursed, and taken care of during the work hours of the day.

Crécy-en-Ponthieu, krā-sē ŏṅ pôṅ-tyėr, or **Cressy,** a village in the French department of Somme, on the Maye, 12 miles north of Abbeville. Crécy has a 15th century church and is celebrated on account of the brilliant victory obtained here, 26 Aug. 1346, by Edward III., with 40,000 English soldiers, over a French army amounting, according to Froissart, to 100,000 men under the command of the Count of Alençon. In this great battle perished the flower of the French chivalry, as well as the blind king of Bohemia, who was fighting on the side of France. The Black Prince distinguished himself greatly, bore the brunt of the fight, and gained his spurs. After this battle, tradition says, the Black Prince assumed the crest of the slain king of Bohemia, which consisted of three ostrich feathers with the motto *Ich dien*, "I serve," but this is more than doubtful. The battle of Crécy was one of the first in which cannon were used by English troops. Pop. about 1,400.

Credence, a small table placed near the altar or communion table, at its south side, on

which the bread and wine intended for consecration are placed in readiness. In the Greek Church this is called the *trapeza prothescos,* or simply *prothesis,* but is always placed north of the altar, usually in a structural side-chapel. Archbishop Laud was a great stickler for the credence, and it was sometimes used in the English Church.

Credi, Lorenzo, lō-rĕnd'zō krā'dē, Italian artist: b. Florence 1459; d. there 12 Jan. 1537. He was a fellow pupil of Leonardo da Vinci in the school of Verocchio, and so closely followed his style that some of his copies of Leonardo's works are scarcely to be distinguished from the originals. His 'Holy Families,' of which he painted a great number for private collections, are gracefully designed and highly finished. His most esteemed works are a 'Madonna and Child with Saints Julian and Nicholas,' now in the Louvre, and the 'Nativity' at Florence.

Credit, in political economy, the postponement of the payment of a debt agreed upon by the parties. It implies confidence of the creditor in the debtor; and the credit system implies general confidence in people's ability to meet their obligations. The modern credit system does not rest on good faith alone, but its extensive use in commercial transactions is made possible by the use of bonds, drafts, checks, promissory notes, etc. By means of a credit system a comparatively small stock of money can be made to do duty for carrying on a number of different transactions, but it is indispensable for every good system of credit that money be instantly available when required. Public credit is the confidence which men entertain in the ability and disposition of a nation to fulfil its engagements with its creditors. The term is also applied to the general credit of individuals in a nation. The credit of the government does not always flourish or decline at the same time as private credit, yet there is some correspondence between the two, as general individual confidence can rarely if ever persist in the midst of distrust of the government, and a firm confidence in the government tends to promote a corresponding confidence among citizens.

Crédit Foncier, krā-dē fôn-sē-ā, in France, a mode of raising money on land, the peculiarity of which is that the advance must not exceed one half of the value of the property pledged or hypothecated, and that the repayment of the loan is by an annuity terminable at a certain date. Several companies have been established by the government with the privilege of making loans.

Credit Insurance. See INSURANCE, CREDIT.

Credit, Letter of, an order given by bankers or others at one place to enable a person to receive money from their agent or agents at another place; when it is an order on more than one person or firm it is known as a circular letter of credit.

Crédit Mobilier, krā-dē mō-bē'lī-ĕr (Fr. krā-dē mō-bē-lē-ā), a large company, incorporated under the name of Société générale du Crédit Mobilier, in France in 1852, and sanctioned by the then existing government. Its objects were: (1) To take in hand and originate trading enterprises of all kinds, on the principle of limited liability. (2) To supersede or buy up trading companies; and to substitute scrip and shares of its own for the shares and bonds of the company. It had at the time of its formation a capital of 60,000,000 francs, and did a very extensive business. In 1855 the directors proposed to issue bonds to the amount of 240,000,000 francs, but financiers feared so large an amount of paper currency, and the issue was forbidden by the government. The prosperity of the company declined after this, and the management changed in 1871.

Crédit Mobilier of America, the source of the most tremendous legislative scandal in American history. The national government in 1864 had chartered a "Union Pacific Railroad," with $100,000,000 capital, to complete a transcontinental line west from the Missouri River; and offered to assist it by a loan of $16,000 to $48,000 a mile according to location, over $60,000,000 in all, and a land grant of 20,000,000 acres, worth $50,000,000 to $100,000,000. Even this offer attracted no subscribers; it meant building 1,750 miles of road through desert and mountain, at enormous cost of freightage for supplies, with frequent bloody encounters with Indians, and no probable early business to pay dividends. Then a House committee, of which Oakes Ames (q.v.) was a member and probably advised the plan, added an authorization to the railroad to issue its own bonds dollar for dollar with the government's, the former to be first mortgage and the latter second; the bonds might be issued 100 miles in advance of construction. In other words, the government assumed all the risk. Still the stock had no marketable value on its own basis as an investment, but only through the government's offers in excess of probable cost, which made it worth while for capitalists to take it up and earn them. Mr. Ames, the soul of the enterprise, and a few associates, knew that this cost would not be much more than half the government's loan and gift together. To gain possession of the balance, it was decided to form the stockholders of the Union Pacific into a duplicate corporation under another name, as a construction company, to which the railroad company should turn over its bonds and stocks as payment for work and supplies. Thus the Union Pacific would be stripped of everything but its roadbed and equipment, while its double would pay business rates and pocket the remainder. Besides Mr. Ames, the chief managers were Thomas C. Durant, vice-president of the Union Pacific (John A. Dix being president), Cornelius S. Bushnell, and John B. Alley. They and their associates bought up a moribund Philadelphia concern called the "Pennsylvania Fiscal Agency," chartered in 1859 and organized as a loan and contract company in 1863, and rebaptized it the "Crédit Mobilier of America," oddly, as its French prototype was bankrupt and not in good savor. The Union Pacific stockholders took the same amount of stock in it as in the road. The history of the details by which it accomplished the objects of its being cannot be given here. In 1866 the government extended its offer to such mileage as the Central Pacific should build east from its California lines, and the two companies began a race to secure the benefits. Probably the Central Pacific gained as much profit as the Crédit Mobilier, but that was legitimately earned for its stockholders; and even the Crédit Mobilier's action would have been less obnoxious but for the collusion of government directors and public representatives. The net result was that the

nation paid $94,050,287.28, and the Crédit Mobilier $50,720,000.84, leaving a profit of $43,329,328.34, counting at par the stock and bonds with which the Credit Mobilier paid itself; on the statement of the trustees, they realized only $23,300,319.81 in cash. But this was certainly much understated; and even so, it was all gained in two years, to December 1868. But the rise of Crédit Mobilier stock in a few months from five cents on the dollar to three or four hundred and then out of the market, the payment of over 500 per cent a year dividends, the knowledge that there was only one place they could come from, and the inference that the government trustees must be incompetent or worse, roused suspicious excitement. Then the promoters began to quarrel bitterly over the division of spoils, and to sue each other, and one of them came within an ace of exposing the whole, and outsiders demanded a share as the price of silence or assistance. The Crédit Mobilier needed additional legislation, and procured it by "special legal expenses"; and in the latter part of 1867 the suit of an outsider, H. S. McComb, to obtain stock to which he alleged a claim, laid the mine for the final explosion. Representative Elihu B. Washburne of Illinois had moved an investigation and the fixing of transportation rates, and in alarm Mr. Ames (also a representative) came to Washington with 343 shares of stock, then commanding 100 per cent premium, but which he sold to congressmen and leading government officials at par. In a phrase that became classic, he afterward said that he had put the stock "where it would do the most good." McComb asserted his right to 375 shares, and to quiet him Mr. Ames, in February 1868, told him the names of the public men to whom he had "sold" the stock. McComb bided his time, and in the presidential campaign of 1872 published those names, or what he alleged to be those; but he added others, or was misinformed, as some of the accused had perfectly clean hands. The list was shocking: the Vice-President of the United States (Colfax), the Vice-President elect (Wilson), the speaker of the House (Blaine), and many other eminent names. When the third session of the 42nd Congress opened in December 1872, the speaker descended to the floor and demanded a committee of investigation containing a majority of his political opponents; which was appointed, with Luke P. Poland of Vermont as chairman. It made a report 17 Feb. 1873, which proved that the speaker had been offered the stock but had refused to touch it, as had Conkling, Bayard, Boutwell, and others. Some had taken it but returned it when law suits were threatened, without retaining the dividends; some kept it and justified it openly as a business investment; some kept it and the dividends till investigation was imminent, and possibly kept the dividends altogether, a few kept both and attempted to deny or explain away the ownership. The report recommended the expulsion of Oakes Ames for using the stock to influence the votes of members of Congress; and of James Brooks, a government director of the Union Pacific, for using his position to obtain stock for himself or his family. The vote on the report was deferred for a week, and the House merely censured both, who by a strange coincidence died shortly after, only a week apart. In the Senate, an investigating committee recommended the expulsion of Senator Pomeroy of Kansas, but no action was taken upon it. Consult: Crawford, 'The Credit Mobilier of America' (1880); Hazard, same title (1881), paper before the Rhode Island Historical Society; 'Scribner's Magazine,' 'The Crédit Mobilier' (March 1874).

Cree Indians, a tribe of North American Indians of Algonquian stock, living on several reservations in Manitoba and Assiniboia, near Lake Winnipeg and the Saskatchewan River. The tribe numbers about 10,000. See ALGONQUIAN.

Creech, Thomas, English classical scholar: b. Blandford, Dorsetshire, 1659; d. Oxford June 1700. He owes his fame almost exclusively to his translation of Lucretius, the poetical merit of which is not very great, although, in the versification of the argumentative and mechanical parts, considerable skill is exhibited. As an editor of Lucretius, he is chiefly valuable for his explanation of the Epicurean philosophy, for which, however, he was largely indebted to Gassendi.

Creed. See CREEDS AND CONFESSIONS.

Creede, a town and county-seat of Mineral County, Col.; on the Denver and Rio Grande R.R.; 35 miles northwest of Del Norte. It is a mining town named after N. C. Creede, who staked the first claims here in 1889. Nearly destroyed by fire in 1892, it was rebuilt and has public schools, weekly newspapers, and a national bank. Pop. (1900) 938.

Creedmoor, a rifle range belonging to the State of New York, located near Queen's station on the Long Island R.R., just within the boundaries of Greater New York. Each regiment of the 1st and 2d brigades of the National Guard is required to practise at Creedmoor at stated times. The range extends over 85 acres, has 30 targets, and can be used at any distance from 50 to 1,200 yards.

Creeds (Lat. *credo*, "I believe") **and Confessions**, formularies of the Christian doctrines professed by the several churches; of these the earliest is the Apostles' Creed. The existence of this formulary in the age next following the age of the apostles is with great plausibility inferred from the wording of the following passage from the work 'Against Heresies,' written by St. Irenæus, who died about 202, being then 60 or perhaps 80 years old; and the order in which the topics of the Apostles' Creed occur in the passage gives force to the conjecture based on its phraseology; says Irenæus of the Christians of his day: "All teach one and the same *God the Father*, and believe the same œconomy of the *incarnation of the Son of God*, and know the same gift of the *Spirit*, and meditate on the same precepts, and maintain the same form of constitution with respect to the *Church*, and look for the same *coming* of the Lord, and wait for the same *salvation* of the whole man—that is, of the soul and *body*." Rufinus, who lived in the latter half of the 4th century, gives us the "symbol" of the apostles as it was received by the Roman Church of his time; it is shorter than the form that is now current, but it contains nearly all the articles of the now existing creed and in the same words and the same order. The other principal creeds of the Roman Catholic Church are the Nicene,

properly Nicæo-Constantinopolitan, for its comprises the creed of the fathers of the first Council of Constantinople (381) as well as that promulgated by the Nicene fathers (325). The addition of *Filioque* ("and from the Son") was probably not inserted in this creed till the middle of the 7th century. The Athanasian Creed is not believed to be the work of St. Athanasius, and the earliest date to which it can plausibly be traced seems to be about 430; but its origin may be much later. The Tridentine Profession of Faith, called also the Creed of Pius IV. (1564), contains an exposition of the tenets of the Roman Catholic Church as opposed to those of the Reformed churches.

Very numerous are these latter creeds. The first of them, the Augsburg Confession ("Confessio Augustana") drawn up by Melanchthon and presented to the Emperor Charles V. at Augsburg in 1530, is the most authoritative exposition of the Lutheran tenets; it was added to, explained or modified by other similar documents, as the 'Apologia Confessionis Augustanæ' (also by Melanchthon), a defense of the Confession of Augsburg; the Smalkald Articles (1536), drawn up by Luther; and the Formula of Concord, designed to reconcile differences among the Lutherans and to check a movement toward Calvinism. The chief confessions of faith formulated by the "Reformed," as distinguished from the followers of Luther, are: the 'Confessio Tetrapolitana' (confession of the four towns, namely, Strasburg, Constance, Meiningen, and Landau), and two or three other confessions. These all preceded the Calvinian Confessions, but they contain tenets near allied to those of Calvinism and Presbyterianism. Then came the confessions drawn up by John Calvin or under his influence, the first of these, 'Consensus Tigurinus' (the Zurich agreement), drawn up by Calvin himself, was designed to bring the followers of Zwingli and of Calvin into one communion; the others were the Gallic (or French), the Belgic (or Dutch), and a second Helvetic (or Swiss) confession. These were followed about 50 years after, the latest of them, by the celebrated Decrees of the Synod of Dordrecht (1619). The Articles of the Church of England's faith were, when first promulgated (1552), 42 in number, but later that number was reduced to 39. In 1646 was published the great Westminster Confession of Faith by the Presbyterian divines of England, Scotland, and New England, which in the year 1903 has undergone amendment by vote of the Presbyterian churches of the United States. Dr. Philip Schaff's work, 'The Creeds of Christendom' (1877, 3 vols.) is a trustworthy collection of all the creeds, with instructive notes.

Creeks (named for the same reason as or in translation from their Algonquin name, Muskoki, "creeks," from their many-rivered land), a once powerful confederacy of Gulf Indians, the strongest Indian power south of New York, except the Cherokees. They occupied a large part of Georgia and Alabama, and formed the largest section of the Muskhogean stock. The Muskogi were the dominant tribe, and their language, the *lingua franca*, of the confederacy; others at the outset were the Coosa, Kasihta, Kawita (Coweta), etc.; later came in the Alibamu, Hitchiti, Kosati, Yamasi (Yemassee), Yuchi or Uchee, Natchez, and others, and a band of Shawanoes had been incorporated by desire or force. The Seminoles ("wanderers") of Florida had broken away from them. They numbered probably 30,000 at their highest. Lying between the English spheres in Georgia, the Spanish in Florida, and the French at Mobile, and in Louisiana, each power bid for their support, and they shifted from side to side; but the destruction of the French power and the cession of Florida 1763–83, left the English supreme. In 1763 they had 5,860 warriors and 50 towns; the latter of log houses plastered outside with clay, and as with all the southern tribes, built in an oblong with a space in the centre for public ceremonials, like the classic forum or agora. Their head chief was called mico, besides whom they had a war chief; no chiefs seem ever to have been deposed, but new ones added, and at last they became so burdensome that their number was limited to 500. In the Revolution the Creeks took the English side, and after it many southern Tories took refuge among them and kept them stirred up to hostility; Congress had determined on war, but in 1790 the chiefs were induced to visit New York, and made peace for both Upper and Lower Creeks and Seminoles. This did not prevent attempted raids on Nashville and Knoxville 1792-3. A number of treaties were made with them involving cessions of land in the years after 1786; and from 1800 on, a number of them settled in Louisiana, and later in Texas, where they remained on a reservation till reunited with the others in 1872. In the War of 1812 the English induced one section of them to rise against the Americans, and they perpetrated the massacre of Fort Mimms, 30 Aug. 1813; but American vengeance fell on innocent and guilty alike, and the main fighting force was finally defeated and slaughtered out at Horseshoe Bend, 27 March 1814. Over 2,000 warriors had been killed and their lands ravaged and towns burnt, and they submitted. This gave an impetus to the Georgian impatience to have Congress fulfil its promises of buying up the Indian titles and deporting the tribes; but the obstinate refusal of the tribes to consent led to trickery and violence to obtain the result. (See CHEROKEES; CHEROKEE CASE, some of which applies to the Creeks also.) The party of consent made a treaty 12 Feb. 1825, ceding all their Georgia and part of their Alabama lands, for equivalent lands in Indian Territory and $400,000 in cash; it was made through their chief, William McIntosh, who was at once put to death according to their law. But by a treaty of 24 Jan. 1826, at Indian Springs, the complying party ceded most of their Georgia lands, and by 1828 the other section had been bought over to ratify it. In 1836 some of the Creeks joined the United States forces against the Seminoles, but others began raiding Georgia and Alabama villages. Scott reduced them, and the government at once began deporting them to the Arkansas; 24,594 were removed, and 744 left behind. The government tried to Christianize and civilize them, but they fiercely refused either missionaries or schools; especially Christianity, which to them was a badge of their negro slaves. In 1857 they numbered 14,888. In the Civil War they divided, and after three battles the Confederate section drove the other into Kansas, where many perished, and 1,000 entered the United States army.

After the War they were forced to cede 3,000,000 acres of land, for $975,000. Their government is the same as that of the Cherokees. The number in 1900 was 7,903 of Indian blood; but there are thousands of mongrels, and many of the tribe have taken lands in severalty. The "nation," white, negro, and Indian, numbered in 1900, 40,074.

Creelman, James, American war correspondent and journalist: b. Montreal, Canada, 12 Nov. 1859. He entered the service of the New York *Herald* in 1877; was an editorial writer and correspondent 1877–89; editor of the London edition 1890, and of the Paris edition 1891–2, when he became editor of the New York *Evening Telegram*. He represented the New York *World* in the China-Japanese war of 1894; the New York *Journal* in the Græco-Turkish war 1897, the Spanish-American war 1898, and the Philippine insurrection 1899. He was a volunteer aide on Gen. Lawton's staff in the Philippines, and since 1900 has been the Washington correspondent of the New York *World*. He has published: 'On the Great Highway' (1901), an account of his travels as a correspondent; 'Eagle Blood' (1902), a novel.

Creeper, a local name of a variety of small birds. The term is usually distinguished by prefixes, but most frequently used for the tree-creepers (*Certhiidæ*). With the one exception all of the 12 or 14 species and 5 genera are confined to the Old World, those of Africa and Australia being less typical than the north temperate *Certhia*. The common or brown creeper (*Certhia familiaris*) has a slender curved bill, strong feet with short tarsi, 12 stiff, acuminate tail feathers, and brown plumage streaked with white. In a number of varieties it occurs in temperate North America and Europe, breeding mostly to the north. It is a common little bird in open woodlands. Encircling trees spirally from the base upward, it clings to the bark in the manner of woodpeckers by means of the feet, aided by the stiff tail feathers, and picks insects and their eggs from the crevices with its sharp bill and slender exsertile tongue.

Crefeld. See KREFELD.

Creighton, James Edwin, Canadian-American philosopher, teacher and writer: b. Pictou, N. S., 1861, graduated from Dalhousie College 1877, and studied philosophy at Cornell University and at the universities of Leipzig and Berlin. Ph.D. (Cornell University) 1892, LL.D. (Queens University) 1903. Sage Professor of Logic and Metaphysics in Cornell University since 1895. Editor 'The Philosophical Review' and American editor 'Kant-Studien.' He was the first president of the American Philosophical Association, which was organized in 1902. He has published 'An Introductory Logic' (1898) and been a frequent contributor to philosophical journals.

Creighton, krā'tŏn, **Louise von Glenn,** English historian: b. Sydenham, England, 7 July 1850. In 1872 she was married to Rev. Mandell Creighton (q.v.), then rector of Embleton, Northumberland, but subsequently Bishop of Peterborough 1891–7, and Bishop of London 1897–1901. She is the author of lives of the Black Prince, Sir Walter Raleigh, and the Duke of Marlborough, in Longman's 'Historical Biographies'; 'England a Continental Power'; 'Social History of England'; 'Government of England'; 'First History of England'; 'First History of France.'

Creighton, Mandell, English Anglican prelate and historian, b. Carlisle 5 July 1843; d. Fulham, London, 14 Jan. 1901. He was educated at Merton College, Oxford; ordained deacon in 1870, and priest in 1873. He was vicar of Embleton, Northumberland, 1874–84, and in the latter year was elected to the Dixie professorship of ecclesiastical history at Cambridge, being the first occupant of the chair. In 1885 he became canon residentiary of Worcester cathedral, but in 1891, on his appointment as Bishop of Peterborough, vacated both that post and his professorship. In 1897, he became Bishop of London. The most important of his numerous historical works is his 'History of the Papacy During the Reformation' (1882–94). Other publications of his include: 'Primer of Roman History' (1875); 'Life of Simon de Montfort' (1876); 'The Age of Elizabeth' (1876); 'The Tudors and the Reformation' (1876); 'Cardinal Wolsey' (1884); 'Carlisle' (1889); 'The Early Renaissance in England' (1895); 'The English National Character' (1896); 'Story of Some English Shires' (1897); 'Persecution and Tolerance'; 'Counsels for Church People'; 'Historical Essays and Reviews' (1902). He founded the 'English Historical Review' in 1886, and acted as editor till 1891. At the 250th anniversary of Harvard University in 1886, he represented Emmanuel College, Cambridge.

Creizenach, Theodor Adolf, German poet and literary historian: b. Mainz 16 April 1818; d. 5 Dec. 1877. He was educated at Giessen, Göttingen and Heidelberg, and was prominent among the Jews in Frankfort until his conversion to Christianity in 1854. After that time he taught in the public schools in Frankfort, becoming professor of history and literature at the gymnasium in 1863. He wrote poems published in two volumes (1838 and 1848) and edited the letters of Goethe and Marianne von Willemer.

Crell, Lorenz Florenz Friedrich von, German chemist: b. Helmstadt 21 Jan. 1744; d. Göttingen 7 June 1816. He was a councilor of mines, and successively professor of chemistry at the Collegium Carolinum, in Brunswick 1771–3; of philosophy and medicine at Helmstädt University till 1810; and of chemistry at Göttingen. He published a large number of investigations, as upon putrefaction, the growth of plants in pure water, boracic acid, phosphoric acid, etc.; but is best known by his periodicals devoted to the recording of chemical discoveries, by his translations from French and other journals, and by those of the works of Kirwan, of Blagden, of Crawford, of Dobson, and of Black.

Crema, krā'mā, Italy, an episcopal city in Lombardy, province Cremona, in a beautiful plain on the left bank of the Serio, 25 miles east of Milan. It was founded about 570, and was destroyed in 1159 by Frederick Barbarossa, for taking part with the Guelfs. It was rebuilt in 1185. It is now a well-built town, enclosed by a brick wall and a ditch, and containing an old castle, a cathedral dating from the middle of the 14th century, a picture gallery, and several educational institutions. Pop. about 10,000.

Cremation, the practice of burning the dead, instead of burial. The custom is of ancient origin, and has been revived in modern times, on sanitary grounds. In Greece burial was practised through the 5th century B.C., but with the spread of belief in a future life and the need of purification by fire, cremation became common. It was the Roman custom also, and only with Christianity did earth-burial become the rule in European civilization. In 1873 there was a strong agitation in New York more or less echoed in other parts of the United States, in favor of cremation, and the newspapers published numerous opinions of eminent physicians and others to the effect that burial grounds were an injury to the health of the living, especially in populous sections. There was a similar movement in the leading countries of Europe about the same time. In 1876 Dr. F. Julius LeMoyne established the first crematory in the United States, at Washington, Pa., the first incineration being that of the body of Baron de Palin, in December of that year. This was a semi-private institution, the first thrown open to the general public in this country being the Fresh Pond crematory, operated by the United States Cremation Company of New York. Others were built in leading cities, there being a total of 24 at the close of the year 1900, located as follows: Baltimore, Md.; Boston, Mass., Buffalo, N. Y.; Cambridge, Mass.; Chicago, Ill.; Cincinnati, Ohio; Davenport, Iowa; Detroit, Mich.; Ft. Wayne, Ind.; Lancaster, Pa.; Los Angeles, Cal.; Milwaukee, Wis.; New York (Fresh Pond), N. Y.; Pasadena, Cal.; Philadelphia, Pa.; Pittsburg, Pa.; San Francisco, Cal.; St. Louis, Mo.; St. Paul, Minn.; Swinburne Island, N. Y.; Troy, N. Y.; Washington, D. C.; Washington, Pa.; Waterville, N. Y. The construction of the cinerators or cremation furnaces is commonly of firebrick and iron, there being a fire chamber below and a body chamber above. Coal is the usual fuel, though natural gas has been employed where available. The furnace is arranged to be heated to as great a temperature as 2,500° F., and at this heat a body is consumed in from one to three hours. The greatest mechanical difficulty in connection with incineration has been the disposal of the gases and fluids, and the leaving of the ashes unmixed with foreign substances. All this has been successfully accomplished by perforating the retort or body chamber to allow the gases to escape, and by keeping the fuel flames from direct contact with the body. When the body is removed from the coffin (which is burned separately) it is wrapped in an alum-soaked sheet, and placed in the retort. The weight determines the length of time it is subjected to the heat, but at the proper interval the attendants remove it, and fan out the ashes of the clothing, which are lighter than the bone ash; then pass a magnet through to remove any iron, and as a result customarily secure from one half to five pounds of pure bone ash, which is sealed in a black tin canister. There is frequently an urn hall in connection with a crematory, having niches in the wall, for storing urns containing the ashes of the dead. Funeral services are often held in this hall.

While cremation has made considerable progress in civilized countries, sentiment has undoubtedly prevented its becoming a very common custom. The method seems unnatural to many, and grates upon their sensibilities, preventing their acceptance of this means of disposing of their dead. It appeals largely to the judgment of those who are of a practical turn of mind, and probably a majority of incinerations are made at the request of the deceased, and not by the wish of relatives. The method of passing a corpse into the retort in view of the mourners is not calculated to afford the sentimental pleasant thoughts in connection with the last look at the remains of one they have loved, and it has been suggested that cremation would be more common if the custom were to cover the coffin with flowers and then carry it out of sight on an elevator, leaving the more unpleasant work to be done entirely out of sight. Notwithstanding these drawbacks there have been recorded a little over 13,000 cremations at the crematories of the United States up to the close of 1900, and a little over 14,000 in the leading countries of Europe. This indicates that cremation is slightly more favored in this country than abroad, though nearly all of the very large cities of Europe are supplied with crematories. The history of modern cremation shows a slow but steady increase in the number of crematories and of incinerations.

The advocates of cremation point out that where burial is resorted to, even though the cemetery be located at a distance from dwellings, there must be contamination of the water and the air, because they are the only means of carrying off the products of dissolution. In these days of reaching out for streams to supply reservoirs for cities and towns, it becomes a difficult problem to insure protection of the water supply from burials in the same watershed.

For further information on this subject, the most complete work is Cobb's 'Quarter Century of Cremation in North America' (1901).

Cremer, Jacobus Jan, yä-kō'boos yän krā'-mėr, Dutch novelist: b. Arnheim 1 Sept. 1827; d. The Hague 5 June 1880. He was a painter, but forsook the pencil for the pen. His series of 'Stories of Betuwe' (a rural district) are specimens of idiomatic expression, faithful portraiture, and unsophisticated humor. The same traits distinguish all his works, 'Daniel Sils' (1856); 'Anna Rooze' (1867); 'Doctor Helmond and His Wife' (1869), etc.; but he is at his best amid rural scenes. He published a volume of 'Poems' (1873).

Crémieux, Isaac Adolphe, ē-zäk ä-dōlf krā-mē-ė, French jurist and politician: b. Nimes 30 April 1796; d. Passy 10 Feb. 1880. He became an advocate in Paris in 1830; in 1842 entered the Chamber, and in 1848 was a member of the provisional government. Imprisoned at the *coup d'état*, he subsequently confined himself to professional work till 1870, when he was a member of the government of national defense. He was made a senator in 1876, and was the founder of the Alliance Israélite Universelle.

Cremnitz. See KREMNITZ.

Cremona, krā-mō'nä, Italy, a city and capital of province of same name, on the left bank of the Po, 47 miles south of Milan. It is surrounded by walls and wet ditches, and defended by a citadel. The most remarkable edifice is the cathedral, begun in 1107 and completed about 1491. It exhibits little harmony of parts, but has a venerable and impos-

ing appearance, and its interior decorations are of the most costly description. Close by, and connected with the cathedral, is the Torazzo, a Gothic clock tower, 370 feet high, built of brick and having 490 steps to the bell-story. Cremona has considerable manufactures of linen, silk, earthenware, colors, and mustard, the latter of which is much esteemed in Italy. It was at one time celebrated for its violins. Their manufacture was almost wholly confined, for nearly 100 years, to a family of the name of Amati. Antonius Stradivarius and Joseph Guarnerius were also celebrated violin-makers of Cremona.

Cremona was colonized by the Romans 219 B.C. and again 190 B.C., and became a populous and flourishing town. In the war between Vitellius and Vespasian it was plundered and burned by the troops of the latter, but was subsequently rebuilt by Vespasian. After the fall of the empire it eventually fell under the dominion of the Visconti of Milan. In 1796 it was taken possession of by the French, and was included in the Cis-Alpine Republic, and afterward, from 1800 to 1814, in the kingdom of Italy under Napoleon. Pop. 37,400.

Crenelle, krĕ-nĕl', an opening in an embattled parapet; a loop-hole or embrasure through which to shoot.

Crenic Acid, a vegetable acid having the formula $C_{12}H_{12}O_8$, said to exist in vegetable mold, and in marshes, peat bogs, and the deposits thrown down by ferruginous waters. It is pale yellow in color, and uncrystallizable.

Creodonta, krē-ō-dŏn'ta, an extinct suborder of the carnivora (q.v.), distinguished by many primitive characters, and especially by the scaphoid and lunar bones of the wrist being separate instead of united into a single bone as in modern carnivora. In all modern land carnivores the last premolar tooth in the upper jaw and first true molar in the lower jaw are enlarged and peculiarly adapted to cutting flesh (hence called "carnassials"), working against each other like a pair of shears. This is also the case with one group of the *Creodonta*, from which the modern carnivora are descended. But in most creodonts there is no specialized carnassial, or it is developed from other teeth; these groups evolved on lines similar to the true carnivora, but have left no descendants. One group, the arctocyons, resembled the bears, with omnivorous teeth, plantigrade feet, and large compressed claws. Another group (*Mesonyx*, *Pachyæna*, etc.) resembled rather the hyenas, with large strong teeth fitted for bone-crushing, and digitigrade feet. Others had the teeth more especially adapted to cutting flesh, the first upper and second lower molar being developed into carnassials in *Oxyæna* and *Patriofelis*, the second upper and third lower molar in *Hyænodon*. Besides these larger forms from the size of a polar bear to that of a prairie wolf, there was a great variety of smaller creodonts, some more or less transitional to the primates, others to the insectivores. The early creodonts appear to represent most nearly the central stock from which most, if not all, of the modern mammals are descended (see Condylarthra). Creodonts were the dominant carnivora of the Eocene Epoch, and a few survived into the Oligocene, when their place was taken by the true carnivora of more modern type. The evolution in the creodonts and true carnivores of carnassials of remarkably similar form out of different pairs of teeth originally much less alike, is an excellent instance of "convergence" in evolution. W. D. Matthew,
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Creole, a person born in America or the West India Islands, of pure European blood; as, a Spanish creole. It is sometimes, also, applied, but wrongly, to any person born within tropical latitudes, of whatsoever color. In South and Central America the creoles enjoy high social privileges, and a creole nobility long existed in Venezuela. They are sallow, finely formed, and dark-eyed. Creole dialects are an interesting example of broken-down grammar. Consult: Thomas, 'Theory and Practice of Creole Grammar' (1869).

Creole Case, 1841–2, one of the landmarks of the anti-slavery struggle. On 27 Oct. 1841 the brig Creole sailed from Hampton Roads to New Orleans with 130 slaves; on 17 November 17 of them rose and overpowered the crew, killed one of the owners, and ran the vessel into the English port of Nassau. The authorities, as wont, imprisoned those directly charged with mutiny and murder, and let the rest go. Webster, then secretary of state, demanded from England the surrender of the whole, as being legal property of a State under the Constitution, engaged on a legal voyage (Coastwise Slave-trade Act of 2 March 1807), and covered by the United States flag on the high seas. This was Calhoun's exact theory. The English government refused, but a new extradition treaty was agreed on (9 Aug. 1842). In the House, 21 March 1842, Joshua R. Giddings (q.v.) presented a set of resolutions which formulated the position of the political anti-slavery party to the end. They were, that the States have exclusive jurisdiction over slavery in their own territory; that the Federal government has exclusive jurisdiction over the high seas; that slavery, as an abridgment of the natural rights of man, can exist only by edict of a municipality and within its power of enforcement (this was Judge Curtis' argument in the Dred Scott case); that a vessel on the high seas has passed from municipal to national jurisdiction, so that Virginia law ceased to apply to the Creole when it left Virginia territory; that the negroes in resuming their natural rights violated no Federal law, and *ex hypothesi* no State law; and that attempts to re-enslave them were violations of the Constitution and laws, the rights of the free States, and national honor. The resolutions roused a storm. John Minor Botts (q.v.) of Virginia moved a counter resolution that no good citizen, and especially no national representative, should provoke contention over a question on which diplomatic negotiations were pending, and which might plunge the whole civilized world into war; and that Giddings' resolutions justified mutiny and murder. He asked a suspension of the rules to give it precedence of Giddings'. Giddings' colleague adopted it and moved the previous question; and after a two days' wrangle on points of order the resolution was passed without debate, 125 to 69. Giddings at once resigned; his constituency immediately re-elected him by an overwhelming majority, and instructed him to

push his resolutions to a vote. As this would "put the Democratic party in a hole," in current slang — the first two clauses being their pet tenets, and the others only obvious inferences from them — they evaded it by abolishing "resolution day" for the rest of the session, devoting the day to other business when it came around.

Creole State, Louisiana, where the direct descendants of the original French and Spanish colonists form an important element in the social fabric.

Cre'olin, a mixture of cresols and creosols derived from the destructive distillation of wood, once used very widely in watery emulsion as antiseptics. The semi-opaqueness of the mixture has rendered creolin obnoxious and its popularity has disappeared.

Creon, krē'ŏn, king of Corinth, as related in Greek legend, and father of Glauce or Creusa, the wife of Jason. The name of a king of Thebes, who was a contemporary of Œdipus. In the legend of the war against Thebes, Creon, the king, is said to have forbidden any one to bury the bodies of Eteocles and Polynices, and their sister Antigone was condemned to death for disobeying this order.

Cre'osote (Greek, "meat-preserver"), a product of the destructive distillation of wood or coal, especially the former. Wood-tar creosote, when freshly prepared, is an oily, transparent liquid, colorless, and of indefinite composition, containing many different chemical substances, chiefly belonging to the aromatic series. It was discovered by Reichenbach in 1832, and for a considerable time was confused with carbolic acid. It has a strong, smoky smell, burns with a sooty flame, and refracts light powerfully. It has been greatly used as an antiseptic, both in dentistry and general surgery, and also for the preservation of meat, from which circumstance it derives its name. Its preservative action is so marked that meat will not decay after it has been treated superficially with a 1 per cent solution. Coal-tar creosote is obtained in the distillation of coal-tar, and is usually understood to include that portion of the distillate which comes over at temperatures between 400° and 760° F., although different temperature limits are used by different distillers. Coal-tar creosote (technically known as "creosote oil") is used for the preservation of timber. For this purpose the timber to be treated is placed in an air-tight cylindrical iron tank, from which the air is exhausted by means of an air-pump. The creosote is then introduced at a temperature slightly higher than 212° F., and the temperature and vacuum are both maintained until the moisture of the wood has been entirely vaporized, and the wood itself impregnated with the oil.

Creosote is also used for fuel, for softening pitch, and as an antiseptic application for the treatment of certain diseases of cattle and sheep. It is but slightly soluble in water, though it mixes readily with alcohol, ether, and many other organic fluids.

For medical purposes "creosote is a mixture of phenols, chiefly guaiacol and creosol, obtained during the distillation of wood tar, preferably of that from the beech." In its physiological action, being a mixture of phenols, it naturally resembles carbolic acid very closely. It is now widely used as a stimulant to digestion and as a tonic in tuberculosis and other wasting diseases. The vapor is of service when inhaled, in diminishing the mixed infections that occur in many cases of tuberculosis. Creosote is not specific for this disease. It is very widely employed in bronchitis and is of service in nausea and as an intestinal antiseptic. Poisoning by creosote is very rare and resembles that of carbolic acid (q.v.).

Crerar, John, American philanthropist: b. New York 1827; d. Chicago 19 Oct. 1889. He entered mercantile life and accumulated a fortune, removing to Chicago in 1862, and adding to his wealth by railway financiering. He readily bestowed large sums upon charitable undertakings, and in his will left $2,500,000 to found the John Crerar Public Library, from which sensational novels and skeptical works should be excluded.

Crescen'do, or **Cres** (Italian), a musical term signifying that the notes of the passage over which it is placed are to be performed with constantly increasing volume of tone. The ancient Romans, as we learn from a passage in Cicero, were aware of its beauty, and practised it continually. Crescendo passages are frequently marked $<$ signifying piano to forte; the corresponding mark $>$ diminuendo, marking the transition from forte to piano.

Crescent (Lat. *crescens*, growing), an emblem representing the moon in her state of increase. The Egyptians and the Greeks decorated their moon-goddesses, Isis and Selene, with the crescent, which announced the returning light of the moon. Athenian citizens of illustrious birth wore crescents of ivory and silver upon their buskins; and the same mark of distinction was granted to the patricians and senators of Rome. It was used by the Romans as an emblem of the eternity of empire. Hence it was found on medals of many cities, particularly of Byzantium, as capital of the Eastern Empire, whence it is supposed to have been borrowed by the Ottomans. Since their establishment in Europe it has been the universal emblem of their empire. During the Crusades, particularly, the crescent was the distinguishing symbol of the Mussulmans, as the cross was representative of the Christians.

Crescent City, a name by which New Orleans is widely known because the older portion is built around a semicircular bend of the Mississippi. Now the city has spread around another bend farther up stream, and is nearly S-shaped.

Crescentia. See CALABASH-TREE.

Crescentini, Girolamo, jē-rō'lā-mō krĕsh-ĕn-tē'nē, Italian singer: b. Urbania 2 Feb. 1766; d. Naples 24 April 1846. He was styled the Italian Orpheus, because of his exquisite mezzo-soprano.

Crescentius, krē-sĕn'shĭ-ŭs, **John,** Roman patriot; d. 998 A.D. He was a leader of the party in Rome opposed to the rule of the emperor in the 10th century. From 985 to 996 his rule in Rome was practically undisputed, and he was recognized as Patricius by the Byzantine empress. In 996 Otto III. came to Rome, and overthrew the rule of Crescentius temporarily, but the latter resumed his position when the emperor left the city, drove the Pope, Gregory V., from Rome, and supported the anti-Pope, John

XVI. Otto, however, finally defeated Crescentius in 998 and had him beheaded.

Crescenzi, Pietro, pē-ā'trō krĕsh-ĕnd'zē, or **Petrus De Crescentiis,** Italian writer on agriculture: b. Bologna 1230; d. 1307. At the age of 70 he was made senator, and he now carried into execution his principles of agriculture on an estate near Bologna, in the cultivation of which he passed the remainder of his life. He has left a work on agriculture entitled 'Opus Ruralium Commodorum,' a remarkable monument of his time, of which it is far in advance. This work was written originally in Latin. There exists an Italian translation (1478), esteemed very highly on account of the purity of the language, which has given rise to the opinion that Crescenzi wrote in his native tongue. His principles are simple, founded upon experience, and free from many prejudices which continued to prevail in Europe for centuries after. His work was translated into several European languages, particularly for Charles V. of France, in a splendid manuscript (1373), still extant; and no sooner was the art of printing invented than copies of this work were greatly multiplied. The oldest known edition, now very rare, appeared at Augsburg in 1471.

Crescimbeni, Giovanni Maria, jo-vän'nē mā-rē'ä krĕsh-īm-bā'nē, Italian scholar and poet: b. Macerata 9 Oct. 1663; d. 8 March 1728. In the Jesuits' college at Macerata he wrote at 13 a tragedy — 'Daris.' At 15 he was a member of an academy, and at 16 doctor of laws. In 1698 appeared his 'Istoria della volgar Poesia,' a work of vast industry, but destitute of method and criticism. He next published his 'Trattato della Bellezza della volgar Poesia' (1700), which passed in a short time through three editions, and like the earlier work was first made capable of being understood and enjoyed by the 'Commentario intorno alla Storia della volgar Poesia' (1702).

Cresco, Iowa, the county-seat of Howard County, situated in the northeastern part of the State, on the Chicago, Milwaukee & St. Paul Railroad. It has foundry, brick, and tile works, and other manufactures; and is the centre of an important dairying and live stock raising region. Pop. (1900) 2,806.

Cresol, krē'sŏl, or **Cressol,** an aromatic compound having the formula $C_6H_4(CH_3)OH$, which may be regarded as derived from phenol by the substitution of methyl (CH_3) for one of the hydrogen atoms in the benzene nucleus. Like all di-substitution benzene compounds, cresol exists in three isomeric modifications, known respectively as orthocresol, metacresol, and paracresol. (See Aromatic Compounds.) All three occur in coal-tar, though the ortho- and para-compounds are present in much larger quantity than the meta-compound. The ortho- and meta-compounds readily yield nitroso-derivatives, and are used in the manufacture of coal-tar colors. Orthocresol melts at 90°, and boils at 370°; metacresol is liquid at ordinary temperatures and boils at 394°; and paracresol melts at 97° and boils at 390°; all these temperatures being on the Fahrenheit scale.

Crespi, Giovanni Battista, jō-vän'nē bät tēs'tä krĕs'pē, Italian painter: b. Cerano 1557; d. Milan 1633. He was educated at Venice and at Rome; and studied architecture and sculpture as well as painting. Among his works is 'The Baptism of Saint Augustine' at Milan.

Crespi, Giuseppe Maria, joo-sep'pē mā-rē'ä, Italian painter, surnamed Lo Spagnuolo: b. Bologna 1665; d. there 16 July 1747. His first work was the 'Combat of Hercules with Antæus.' From this time he had continual employment. He painted for Cardinal Ottoboni the 'Seven Sacraments,' now in the Dresden gallery; several pieces for Prince Eugene of Savoy, for the elector of the Palatinate, for the Grand Duke of Tuscany, and for Cardinal Lambertini, his patron, who afterward, when Pope Benedict XIV., conferred on him the honor of knighthood. Crespi has been frequently censured for the singular ideas which he often introduced into his paintings; for example, he represents Chiron giving his pupil Achilles a kick for some fault that he had committed.

Crespo, krĕs'pō, **Antonio Candido Gonçalves,** gōn-säl'vĕz, Portuguese poet: b. of a slave mother in Rio Janeiro 11 March 1846; d. Lisbon 11 June 1883. He graduated in jurisprudence at the Coimbra University, but devoted himself almost exclusively to the Muses at Lisbon. He published two small volumes: 'Miniatures' (1870); 'Nocturnes' (1882), and in collaboration with his wife, Maria Amalia Vaz de Carvalho, herself a notable writer, was author of 'Stories for our Children' (1882). His poems show high sensibility and great power of poetic form and expression.

Crespo, Joaquin, hō-ā-kēn', Venezuelan military officer: b. Miranda, Venezuela, about 1845; d. 17 April 1898. He received a liberal education, became governor of the State of Guarico in 1880, and was president of Venezuela 1884–6. In 1892 he headed a revolution, making himself dictator. Two years later he was again elected president, serving until 1898. He was killed in battle with insurgents.

Cress, various plants of the natural order *Cruciferæ*. The cultivated ones are all used as salads, for which their pungent foliage especially recommends them. The common or garden cress or peppergrass (*Lepidium sativum*), is generally found in private gardens as a spring annual. The seeds may be sown as soon as the soil can be worked and the fresh herbage cut for use in about three weeks. Successive sowings should be made every three or four days. The plant resembles watercress in flavor, and makes an excellent garnish. Virginia cress (*L. virginicum*) is a similar species and is grown and used like the preceding. Winter or upland cress (*Barbarea vulgaris*) is an annual, common in fields in Europe and America and sometimes cultivated for winter use, as is also its close relative (*B. præcox*) which is called early winter or American cress. Watercress (*Nasturtium officinale*) is a perennial aquatic herb common in cool brooks and yielding an important winter salad where the streams do not freeze. Though it does best in gravelly bottomed shallow streams, it may be cultivated in any moist ground, or under greenhouse benches if well supplied with water. Indian cress which is a species of *Tropæolum* is commonly known as nasturtium, a popular garden flower whose foliage, blossom buds, and blossoms are used as salads, and its immature fruits as a substitute for capers. Several other species of *Cruciferæ* are called cress in various parts of the world.

Cresset, krĕs'ĕt, (1) a bowl-shaped article made of incombustible material, used to contain a light, and hung from above or suspended on a pole or placed as beacon on a watch tower or on some prominent place. The cresset-light was formerly the flame from a coil of pitched rope, and in more modern times oil and wick were used. The large lanthorn of ancient days when suspended from the end of a long pole and carried on a man's shoulder was called a cresset. A stone containing bowl-shaped hollows which are sometimes used as cressets, is called a cresset-stone. (2) An iron frame used by coopers who make barrels by hand.

Cressey, George Croswell, American Unitarian clergyman: b. Buxton, Me., 1 April 1856. He was graduated at Bowdoin College in 1875, the University of Leipsic 1880, and Andover Theological Seminary. He was professor of modern languages in Washburn College 1890–2, and at present (1903) is pastor in Northampton, Mass. He has written: 'The Essential Man' (1895); 'Mental Evolution' (1894); 'Philosophy of Religion' (1892); 'Doctrine of Immortality in Liberal Thought' (1897); 'Soul Power' (1899).

Cressida, in Greek legend a daughter of Calchas, the Trojan priest. She is also known as Briseida, and her fame rests upon the legend of her amour with Troilus. The original story of Troilus and Cressida was ascribed to Lollius, a historiographer of Urbino. It was written in Latin and translated by Chaucer. Cressida was faithless to Troilus and became mistress to Diomede.

Cressol. See CRESOL.

Cresson, Elliott, American philanthropist: b. 2 March 1796; d. 20 Feb. 1854. He was a successful merchant in Philadelphia, where he resided all his life, and a member of the society of Friends. He engaged in establishing the first African colony of liberated slaves in the territory of Bassa Cove, and was agent of the national colonization society. He everywhere recommended his measures with the eloquence of sincere conviction, and met with much favor and success. He sailed to England in 1840, where he spent some years in advocating the project of colonization. His time and labor were contributed without pay, and by his will he distributed his estate to a great variety of charities, mostly to institutions already established, but a bequest of a landed estate of over $30,000 was to establish a home for aged, infirm, or invalid merchants or gentlemen, unable to procure the comforts appropriate to their condition in life.

Cresson, Pa., a village in Cambria County, situated among the Alleghany Mountains at an elevation of 3,000 feet. Its fine scenery and the magnesia springs in the vicinity make it a popular summer resort. Pop. of township (1900) 1,572.

Crest (Lat. *crista,* tuft or comb), the rising on the defensive armor of the head, also the ornament frequently affixed to the helmet, such as a plume or tuft of feathers, a bunch of horse-hair, etc. Warriors have always been in the habit of adorning their persons; and the helmet, from its conspicuousness, is very naturally chosen as the place of one of the principal ornaments. The crests of the earlier Greeks were of horse-hair; afterward plumes, especially red ones, were adopted. In the Middle Ages, when rank and honors became hereditary, and particular heraldic devices were appropriated to particular families, the crest became a distinguishing hereditary mark of honor. It denotes in heraldry a figure placed upon a wreath, coronet, or cap of maintenance, above both helmet and shield; as, for instance, the crest of a bishop is the mitre. The crest is considered a greater criterion of nobility than the armor generally. It is commonly a piece of the arms, rests on a wreath of the principal metal and color of the coat of arms, color and metal alternating, or on a cap of maintenance.

Creston, Iowa, a city and county-seat of Union County, about 200 miles west of Burlington, on the Chicago, Burlington & Quincy R.R. It was first settled in 1869; became a borough in 1871, and a city in 1881. The present form of government is by State enactment under a charter, which provides for a mayor and a council of 10 members. Five aldermen are elected each spring. The city has three banks, with a combined capital of $250,000: 15 churches, public and parish schools, a government building, costing $100,000, and a railroad depot, costing $75,000. It is a trade centre for the surrounding country and has machine shops, brickyards, broom and cigar factories, wagon works, etc. Pop. (1904) 8,000.

Cres'wick, Paul, English writer: b. 1866. He entered the life assurance business at 16 and is now in the head office of the Prudential Assurance Company, London. He has published: 'At the Sign of the Cross Keys'; 'The Temple of Folly'; 'Bruising Peg'; 'Under the Black Raven'; 'Robin Hood' (1902); 'In Alfred's Days.'

Creswick, Thomas, English landscape painter: b. Sheffield 5 Feb. 1811; d. Bayswater 28 Dec. 1869. He studied drawing at Birmingham, and early showed artistic talent. His first pictures were admitted into the Academy exhibition when he was only in his 17th year, and his success was afterward continuous. He was elected an associate of the Royal Academy in 1842, and R.A. in 1851. Among his works are: 'England'; 'London Road a Hundred Years Ago'; 'The Weald of Kent'; 'A Roughish Road'; 'On the Clyde'; 'Sunshine and Showers.' Creswick's landscapes are pleasing and attractive, and display much delicate and finished detail. He was also known as an etcher.

Creta'ceous System, or **Chalk Formation,** a name applied by geologists to the series of rocks which occur between the Wealden group, or, when it is wanting, the Oolite and the lower part of the Tertiary formation. It is usually characterized by white, soft chalk, but sometimes, more especially in Italy and the south of France, this chalk is replaced by compact, solid limestones. The cretaceous rocks consist chiefly of carbonate of lime, but usually abound with silex, in the shape of nodules, plates, and veins, and with iron pyrites in nodules and radiated cylinders. The organic remains in the chalk are, with few exceptions, eminently marine, and from the fine texture of the substance in which they have been imbedded, are usually well preserved. They embrace seaweeds, sponges, corals,

celain-form rhizopods, crustacea, fishes, and reptiles. Deep-sea dredgings in the Atlantic have revealed the fact that a fine, white, organic ooze, resembling the chalk, is still in process of formation in the oceanic abysses at the present day. The American continent shows chalk-beds only in the States of Texas and Arkansas; its cretaceous beds are for the most part made up of marl or greensand, a valuable fertilizer. The Lower Cretaceous occurs in the Gulf States, and the Upper in Rocky Mountain regions, the Chico Series (q.v.) being an important example. See CHALK.

Crete, or **Candia** (called in the most ancient times IDÆA, from Mount Ida, afterward CRETA, whence the Turkish name KIRID), one of the most important islands of the Turkish empire; situated in the Mediterranean, 81 miles from the southern extremity of the Morea, and 230 from the African coast; is 160 miles long, 7 to 35 broad, and contains 3,326 square miles. A high chain of mountains covered with forests runs through the whole length of the island, in two ranges. On the northern side it declines moderately to a fertile coast, provided with good harbors; on the south side, steeply to a rocky shore, with few roadsteads, and reaches its greatest height in the lofty Psiloriti (the ancient Ida), 8,000 feet high, and always covered with snow. Numerous springs give fertility to most of the valleys, in which, and on the declivities of the mountains, is seen a luxurious vegetation. The air is mild; the summer is cooled by the north winds; the winter is distinguished only by showers of rain. Earthquakes, however, are not infrequent. Agriculture is at a very low stage, and education and the amenities of civilized life are almost entirely absent. The principal products of the island are olive oil, wheat, oranges, lemons, silk, grapes, wine, valonia, carobs, and honey. The inhabitants (estimated at 1,200,000 in ancient times, or 900,000 in the time of the Venetians) are now about 309,250, of whom about a third are Mohammedans. Soap is extensively manufactured, and the exports comprise olive oil soap, wool, carobs, cheese, fruits, valonia, acorns, etc. Most of the harbors are silted up. The capital is Candia, or Megalokastron; Canea is the most important place of trade.

Greek mythology made Crete the scene of many of the adventures of the gods and heroes. Here Saturn is said to have reigned, and afterward Minos. These Cretan myths seem to contain many Oriental and Semitic elements. The island figures little in Greek history, and took no part in the wars with the Persians. It possessed a number of independent towns often at war with each other, but ready to combine against a stranger. Crete was conquered by the Romans 67 B.C. In the year 823 it passed from the Roman emperors of the East to the Saracens, who built the capital, Candia, on the ruins of Heraclea, but were expelled again in 961 by the Greeks. The Byzantine sovereign sold the island to the Venetians in 1204, who fortified most of the cities, won the good will of their new subjects by a mild government, and repelled all the assaults of the Genoese and Turks till the middle of the 17th century. About this time the attacks of the Turks became more determined. They landed a large force in 1645, which soon took Canea and Retimo, and besieged the capital with vigor. The siege, the longest in modern history, lasted over 20 years. To assist the Venetians volunteers from all parts of Europe poured in. The Christians, after having exhausted all means of defense, were compelled to surrender to the Turks 27 Sept. 1669. At the time of the capitulation the garrison consisted of only 2,500 soldiers; 30,085 Christians, and 118,754 Turks were killed or wounded during the siege. Having obtained possession of the capital, the Turks now endeavored to expel the Venetians from the strongholds which remained to them on the island, and before the expiration of the 17th century they had been successful in their efforts.

Three pashas, at Candia, Canea, and Retimo, now governed the island. On account of the feuds of these pashas the inhabitants of the western mountains succeeded in forming a government of their own, under Turkish protection. As the compacts made with them by the Turks were not always observed, they were wont in such cases to take up arms, and though they were often defeated they were never entirely subdued. The pashas having demanded hostages of them in 1821, they joined the Greek insurgents.

Had the mountaineers been armed when the Turks made their first descent on the island, it would probably have been impossible for the invaders to have maintained themselves in Candia, but as it was the island remained under Turkish rule. In 1868 a formidable insurrection, fomented by Greece, was with difficulty suppressed by the Turks, after a tedious conflict. In consequence of this revolt the Turks granted to the Cretans a certain degree of autonomy, but Turkish bad faith produced another revolt nine years later. At that time a new constitution of a parliamentary character was inaugurated, but many of its provisions were annulled in 1889. In 1896 there was again a rising against the Turks, in which, as before, the Greeks took part, one result being the outbreak of war between Greece and Turkey. The Greek troops landed on the island were withdrawn at the instance of the Great Powers, who undertook to secure an autonomous government under Turkish suzerainty and to cause the Turkish troops to be withdrawn. On 6 Sept. 1898 the Mohammedans of Candia rose against the Christians, and the fighting resulted in the death of many of the latter, including some British sailors. The leading powers at once demanded the complete withdrawal of the Turkish troops who had abetted the rebels, and ultimately, on 11 October, the sultan complied with their demand, the troops being soon after withdrawn. Shortly afterward Prince George of Greece was appointed high commissioner or governor of the island. There is now a national assembly elected by the people, and the island has received a regular constitution. Consult: Hoick, 'Kreta' (1823–9); Spratt, 'Travels and Researches' (1865); Stillman, 'The Cretan Insurrection of 1866–8' (1874); and Mitchell, 'The Greek, the Cretan, and the Turk' (1897).

Crete, Neb., a city in Saline County in the southeastern part of the State, on the Burlington & M. R.R., and on the Big Blue River. It has several manufacturing industries, including flour-mills. It is the seat of Doane College (Congregational). Pop. (1900) 2,199.

Cretin, krā-tăn', **Joseph**, American ecclesiastic; b. Lyons, France, 1800; d. 22 Feb. 1857. He was ordained a priest in 1838, and was ar-



1. Inoceramus concentricus. 2. Exogyra columba. 3. Inoceramus Cripsi. The hinge, showing ligamentary pits. 4 Ptychodus latissimus. 5. Caprina adversa. The lesser shell, interior. 6. Coelopty hirus reversum. From the side, from above, and from below. 7. [illegible] Koninckii. 8. Hippurites Toucasianus. 9. Caprina adversa. 10. Hesperornis regalis. 11. Ammonites [illegible]. 12. Turritites catenatus. 13. [illegible] Hofmanni. 14. Tooth. 15. Crioceras Duvalii

signed a charge in his own diocese. His great desire was to work in the foreign missions, and when the opportunity to go to America presented itself, he at once accepted. He was somewhat disappointed when he found himself among civilized people in Iowa instead of among Indians. He was made vicar-general of Dubuque, a position which he held until 1851, when he was appointed bishop for the new diocese of St. Paul. He found only nine priests in his diocese, but new parishes were soon opened, schools established, the orphans and the sick received attention, and provisions were made for the Indian tribes, the Ojibways, the Winnebagoes. Consult: Clarke, 'Lives of Deceased Bishops of the United States.'

Cre'tinism, a peculiar disease in children, sometimes persisting into adult life, frequently due to diminution in the secretion of the thyroid gland and prevalent especially in Alpine valleys, differing from rickets in that it is usually accompanied by goitre and commonly results in idiocy more or less marked. Symptoms of cretinism appear, as a rule, during the first year, sometimes not until the child is older. When developed the child is usually very much dwarfed, those of 14 and 15 years of age being not over two or three feet in height. The fingers and toes are short and stumpy, the tissues and skin seem thick and the latter is dark and does not pit. The head is unusually large for the body, the forehead is low, the base of the nose is broad, the lips are thick, the mouth half open, the hair coarse and straight, the teeth appear very late, the abdomen is usually large and hanging, the skin is dry and eczema is common. The voice is usually hoarse and the children do not walk until late in life, perhaps not until the 6th or 7th year. The mental condition is always impaired, cretins being dull, usually good-natured, and they become idiotic. Up to within recent times their condition has been thought to be hopeless, but now with the administration of thyroid gland a number of the cases have been improved. In fact sporadic cretinism invariably improves on the use of thyroid gland, so that cretins of advanced years who have been idiotic and imbecile all their life have been known to recover almost normal functions. See MYXŒDEMA.

Cretonne, krē-tŏn', a cotton cloth with various textures of surface, printed on one side or on both with pictorial and other patterns, and used for curtains and for upholstering. Unlike chintz, it is hardly ever glazed.

Creusa, krē-ū'sa, the name of several celebrated women of Greek antiquity. (1) Daughter of Erechtheus, who, before she was married to Xuthus, gave birth to Ion, the fruit of an amour with Apollo. To her second husband she bore Achæus. (2) The daughter of Priam and Hecuba, wife of Æneas, and mother of Ascanius. In the tumult of the conflagration of Troy, when Æneas fled with the images of his gods, with his father and son, he lost her, and after he had sought her for a long time in vain her spirit appeared to him, saying that the mother of the gods had taken her to herself because she was not willing that she should leave Phrygia.

Creuse, krēz, France, an inland department, south of Indre and Cher; west of Allier and Puy de Dôme; north of Corrèze; and northeast of Haute Vienne; capital, Gueret; area, 2,150 square miles. It is named from the river Creuse, which rises in it, and traverses it diagonally in a northwest direction. The surface is generally rugged, and the soil is thin, rocky, and by no means fertile. Coal is the only mineral worked in this department. Many cattle and notably fine cavalry horses come from Creuse. The chief manufactures are carpets and tapestry. About 15,000 of the inhabitants emigrate in March in search of work, and return about Christmas. The department is divided into four arrondissements. Pop. about 278,000.

Creusot, krē-zō, Le, France, a town in the department of Saone-et-Loire, 236 miles south of Paris. Situated in the midst of a district rich in coal and iron, it owes its importance to the establishment here in 1837 of the great iron works of Schneider & Company, which rank among the largest in the world. They occupy 770 acres, and turn out yearly 190,000 tons of pig iron, besides steel rails, iron rails, and locomotives. Pop. 30,000.

Creutz, kroiz, **Gustaf Philipp,** Graf von, Swedish poet and statesman: b. Finland 1731; d. 30 Oct. 1785. He was a member of the learned and elegant circle which surrounded the queen of Sweden, Louisa Ulrica, sister of Frederick the Great. His 'Atis og Camilla,' an erotic poem in five cantos (1761), and his 'Letter to Daphne' are considered as masterpieces in Swedish poetry. He was appointed minister to Madrid, and, at a later period, to Paris, where he remained 20 years, and became particularly acquainted with Marmontel and Grétry. On 3 April 1783 he signed with Dr. Franklin a treaty of amity between the United States and Sweden. His works and those of his friend Gyllenborg are published together under the title 'Vitterhets Arbeten of Creutz og Gyllenborg' (1796).

Creuzer, Georg Friedrich, gā-ōrg frēd rĭH kroit'sĕr, German philologist and archæologist: b. Marburg 10 March 1771; d. Heidelberg 16 Feb. 1858. He studied at Marburg and Jena, and in 1802 became professor of philology at Heidelberg. In 1807 the professorship of ancient history was also conferred on him, and he held both chairs till his resignation in 1845. His works treat of mythological subjects and classical history, the most important of them being: 'Die historische Kunst der Griechen' (1803); 'Dionysus' (1808); 'Symbolik und Mythologie der alten Völker, besonders der Griechen' (1810–12); and an edition of Plotinus (1835). His symbolical theory of mythology gave rise to considerable controversy with Hermann, Voss, and others. A collection of his writings was published in 1854 under the title 'Opuscula Selecta.'

Crevallé. See CAVALLY.

Crevasse, krĕ-văs', a breach in an embankment of any kind, made to protect lands from inundation, has from the earliest historical ages been of importance. How to guard against crevasses is a matter studied in all countries where their occurrence is a menace to public safety. Lands may be reclaimed from water by means other than embankments, dams, dykes, or levees (see DRAINAGE). The levees and dykes of all places are under a system of supervision for prevention of crevasses and

other dangers. The levees along the Mississippi, begun in 1717, have been at various times and in certain places rendered ineffective by crevasses,—the water breaking through the levee in weak places where soil has become soft, or through holes made by the crawfish. The guards know the need of repairing at once any openings, however small, and the crawfish is regarded as an enemy. In 1882 the damages reported as caused by crevasses and floods were $27,000,000. Towns and farms were inundated and some lives were lost. In the years intervening between 1882 and 1892, damages reported amounted to $77,000,000; and in 1892, $7,000,000. When floods occur, as in 1897 and 1903, the dangers from crevasses increase. Two great crevasses occurred in 1903 during the floods. The damages amounted to millions. In addition to the danger of the water breaking through, there is that of self-protection, the people in the lower towns being tempted to let the waters above them escape from the channel. (See Floods; Levee). For other uses of crevasse, see Glaciers.

Crevaux, Jules Nicolas, zhül nīk-ō-lä krā-vō, French explorer: b. Lorquin, Lorraine, 1 April 1847; d. 24 April 1882. He took part in the Franco-Prussian war, and was later made a surgeon in the navy. In 1876 he turned his attention to the exploration of South America; he first crossed the Tumachumac Mountains; then explored the valley of the Oyapok and its tributaries and several tributaries of the Amazon. In 1880 he crossed the cordilleras of the Andes and reached the Orinoco by the Guaviare River, a tributary never before explored. He returned to France for a short time, but in 1882 started on another expedition, intending to explore the upper part of Paraguay and some of the southern tributaries of the Amazon; when he arrived at Buenos Ayres he became interested in a plan for the exploration of the Gran Chaco and the Pilcomayo River, and joined an expedition for that purpose. He and all but two of his companions were murdered by the Tobas Indians on the banks of the Pilcomayo.

Crevecoeur, krāv'kėr, **Jean Hector Saint John de,** French agriculturist: b. Caen, France, 1731; d. Sarcelles, near Paris, 1813. He emigrated to America in 1754 and for some years lived on a farm near New York. In 1780 he was arrested by the English as a suspected spy and was confined for several months. He then went to Europe but returned in 1783 and was for a long period French consul at New York, where he enjoyed the friendship of Washington and Franklin. He was the author of 'Lettres d'un cultivateur Américain' (1784); 'Voyage dans la haute Pennsylvanie et dans l'état de New York' (1801). His works were translated into English and Dutch and have been greatly admired for the beauty of their style. Consult Tyler, 'Literary History of the American Revolution' (1897).

Crevillente, krā-vēl-yān'tā, Spain, a city in the province of Alicante, about 20 miles southwest of the city of Alicante. The chief industries are agriculture and weaving. Pop. 10,000.

Crew, Henry, American physicist: b. Richmond, Ohio, 4 June 1859. He was graduated at Princeton in 1882; after five years as instructor in physics at Haverford College, Pa., and astronomer at the Lick Observatory, was elected Fayerweather professor of physics in Northwestern University 1892. He has written: 'Elements of Physics' (1899); is assistant editor of the 'Astrophysical Journal,' and has contributed important papers to the 'American Journal of Science' and 'Philosophical Magazine.'

Crewe, a town of England, in Cheshire, 21 miles southeast from Chester, an important station on the London and Northwestern Railway. It is quite a new town, having been as recently as 1842 an obscure village with about 200 inhabitants. The first portion of it was built by the railway company for the accommodation of its workmen. The railway works comprise forges, rolling-mills, locomotive and carriage works, rail works, Bessemer steel works, etc., and give employment to about 7,000 persons. The railway station is one of the largest and finest on the London and Northwestern Railway, and is the point of convergence of six important lines. There are many churches and chapels, market hall, corn exchange, mechanics' institution and town hall, hospital, school of art, a fine public park, and three recreation grounds. The electric light has been introduced. The town was incorporated in 1877, and gives name to a parliamentary division. Pop. (1901) 42,075.

Crewel-work, work executed with the needle, and consisting of designs sewed in colored silk or woolen threads on a basis of unbleached cotton or linen, toweling, or the like. It is a kind of embroidering. See Embroidery.

Creyton, krā'tŏn, **Paul,** a pseudonym sometimes used by John Townsend Trowbridge in the earlier portion of his literary career.

Cribbage, a card game of an essentially skilful nature, played, mostly by two persons, though three or four can be arranged for; with an ordinary pack of cards. Court cards and tens rank equal, all others according to their "pips," ace counting one. The game is to win 61 points. The scores are kept on a tally, each side of which is perforated with six groups of ten holes each. Each player scores the points he makes by inserting a peg into the hole his count entitles him to, on the board. The cards being shuffled and cut, the dealer, from the undermost half of the cards, deals five to each player, beginning with his adversary. The remaining cards are placed face down on the cards already on the table. Both players then inspect the face values of their five cards, and select two each to be thrown out. In this selection each is guided by the remaining cards he holds, and by the fact of whether or no, in the subsequent stage of the game (hereafter explained) he or his adversary will have the benefit of counting to his score, the "thrown-out" cards. The non-dealer then cuts the cards left on the table, again, and the top card is turned face upward. From that moment, for that hand, this "turned-up" card forms, with the four cards "thrown out," what is known as "the crib," which the dealer in each game, after counting the points made off the cards in his hand, is entitled to add to his game. This turn-up card also is counted in the play of both players with the cards in their hand. In the ordinary course the non-dealer begins the game by laying a card down, face upward, on the table, of which he calls out the value. The opposing player has at once to determine how he can best utilize the card so played. There are several

objects to be attained. You can so play as to ensure scoring yourself, or to prevent your opponents playing a next card, which will make all the pips played count 15 (for which he would score two points) or you can secure, or prevent, two or three tens being played in succession; or a sequence of three or four cards; or a flush, that is, three cards of the same suit; with a variety of other possibilities only to be learned by practice, or close study of rules too intricate to be given here. When all the cards have been played, each player's hand, together with the turn-up, is counted for 15, etc. Then the crib, or "thrown-out" cards and "turn-up" are counted for 15, and added to the score of the player entitled to it, for that time. If neither party has scored 61 points, there is another similar deal and the game proceeds until one or the other does score 61. For rules and full particulars consult Spalding's 'Home Library, No. 20' (1902).

CHARLES QUINCY TURNER,
New York City.

Crichton, krī'tŏn, **James,** surnamed THE ADMIRABLE, Scottish nobleman: b. Perthshire, Scotland, 19 Aug. 1560; d. Mantua, Italy, 3 July 1583. His father was a lord of session, and through his mother he was of royal descent. He was one of the young men selected to be fellow-students of the young king, James VI. He then went to France, where he continued his studies, and also, as he adhered to the Roman Catholic Church, took part in the war carried on by Henry III. against the Huguenots. The beauty of his person, the strength and agility he displayed, joined to his multifarious accomplishments and surprising capacity of eloquent talk, made him the admiration of all. About 1580 he went to Italy, visiting Venice, where he was introduced to the Doge and senate, created astonishment at Venice and Padua, by his brilliant off-hand discourses on philosophy, theology, and other high themes, and his challenge to disputation in any of several languages, and on either side of any controversy. He next went to Mantua, and was appointed tutor to the son of a duke. Attacked in the streets one night by a party of men armed and masked, he overcame them by his superior skill, and recognized his pupil, to whom he at once loyally presented his sword. The young prince immediately ran him through with it.

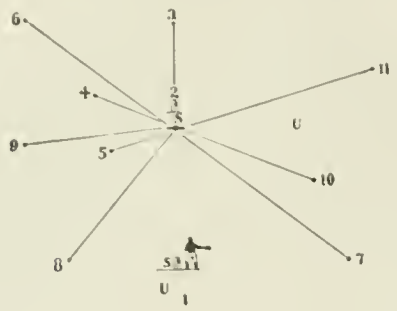
Cricket, the name applied to orthopterous insects of the family *Gryllidæ,* allied to the grasshoppers. Their bodies are somewhat flattened, though in some forms more or less cylindrical, while the abdomen ends in a pair of long, slender stylets. They are active leapers, the hind femora or thighs being enlarged. The males produce a shrilling sound made by raising the upper or fore wings and rubbing them on the hind wings. The noise is due to the clear drumhead-like area in the middle of the fore wings forming a resonant surface; on the hind wings is a raised toothed ridge which rubs on the drumhead above it. The females are silent. They are dull blackish brown. The European house-cricket (*Gryllus domesticus*) has been introduced into New York. It prefers the warmth of the hearth, while our native species live in the open air, the males beginning to sing at the opening of the summer season, which in southern New England is about the 10th of June. See MOLE-CRICKET; TREE-CRICKET.

Cricket, a well-known game, commonly called the national game of England, played in the United States, Great Britain, Australia, and India, the players being arranged in two contesting parties of 11 each. Strutt, one of the best English authorities on ancient sport, adduces some evidence to show that "club-ball," played in the 14th century, may have been the parent of cricket, but both "cat-and-dog" (mention of which occurs in the 16th century) and "stool-ball" (frequently referred to in the 17th century) have a closer affinity. It is stated in Russell's 'History of Guildford' that cricket was played in that town in the middle of the 16th century, but for 50 years subsequently no trace has been found.

Cricket stands pre-eminent in England among the many outdoor pastimes pursued during the summer months. Cricket is not solely an affair of skill; chance is also a factor to a very large extent. Conditions of ground and weather exert such a remarkable influence on the game that in many cases a side which apparently possessed little hope of success has come out of a match victorious. Also a mistake in the field, or an act of carelessness on the part of a batsman, may change the character of the whole game. To excel at cricket it is necessary that the study of the game should begin early; and at nearly all schools a cricket "coach" or tutor is engaged.

Cricket may be played either single-wicket or double-wicket, but it is now so rarely played in the former manner that we can safely confine our attention to the latter. For a double-wicket match game 11 players on a side are necessary, and after the captains have tossed to settle who shall go to the bat first, the loser places his field and the winner sends in two of his surest, safest batters to defend the wickets and to make runs. The disposition of the field depends upon the style of bowling, whether it be fast, medium pace, or slow, and the following diagram will give a pretty clear idea of how the fielders are placed and what dangers the batsman has to guard against. A distance of 22 yards separates the wickets, and by this scale the relative position of the players may easily be estimated. The field having been duly placed, the batsmen having taken their stand, the umpire calls "play," and the bowler sends down his first ball. After five balls have been delivered from one wicket the umpire calls "over," and the whole field changes about till the position of the men bears the same relation to the other wicket that it did to the one first bowled against. These "overs" continue to be bowled from alternate ends by different bowlers until the whole 11 players have tried their hand at the bat and been disposed of. Runs are made by the batsman driving the ball far enough away to give him time to change places with the other batter before the ball returns; each change constitutes a run. Six is the largest number of runs that can be made from a single hit, that being what is allowed when the ball is driven clear out of the grounds. The business of the bowler is to try in every possible way to knock down the wickets in front of which the batsman stands, or else to tempt him into hitting the ball up into the air so that it may be caught on the fly by one of the fielders. Besides being bowled or caught out, a batter may be "run out," that is, have his wickets knocked down by the

ball while he is busy making a run, or he may be "stumped out," which is to have the same thing happen when he incautiously steps out of his ground to hit at a ball. The ball comes to the batter on the first bounce, and the bowler's skill is shown in varying the pitch, speed, and direction of the ball so that the batter may become bewildered and fail to defend his wickets. The best kind of bowling is what is known as "bowling with a break," the peculiarity of which consists in that the ball after striking the ground does not continue straight on, but swerves sharply to the right or left like a "cut" tennis ball.



DISPOSITION OF THE FIELD IN CRICKET.

S, striker; 1, bowler; 2, wicket-keeper; 3, long stop; 4, short slip; 5, point; 6, long slip; 7, long on; 8, long off; 9, cover-point; 10, mid-wicket on; 11, leg; U, umpire.

The great point in batting is to play with a straight bat, that is, as far as possible to swing the bat at right angles to the ground, the advantage thereby gained being that the wickets are more completely covered, and there is less liability of giving a catch. Next in importance is to play forward, that is, to meet the ball as far forward as safety allows and not wait for it to come upon one. Thirdly, it should be the batter's aim to play low; in other words, to hit as many "grounders," or "daisy-cutters," as possible, for they are harder to field, and give no chance for a catch. Two whole days at least are required for a first-class two-innings match. In Canada there are clubs in almost every city, town, and village. In the United States the two chief homes of cricket are in Philadelphia and Boston, although there are good clubs in New York, Detroit, and elsewhere, and also at some of the larger colleges. Consult: Grace, 'Cricket' (1891); Daft, 'Kings of Cricket' (1893); Ranjitsinhji, 'Jubilee Book of Cricket' (1897); and Read, 'Annals of Cricket' (1897).

J. E. SULLIVAN,
New York Athletic Club.

Cricket on the Hearth, a simple story by Charles Dickens, published 1845. It has been adapted for the stage, and used by Joseph Jefferson.

Crillon, Louis des Balbes de Berton de, loo-ē dā bälb dė bėr-tôn dė krē-yôn, French soldier: b. Murs, Provence, 1541; d. Avignon 2 Dec. 1615. In his first campaign, as aide-de-camp to the Duke of Guise (1557–8), he contributed much to the conquest of Calais. He subsequently distinguished himself in the battles of Dreux (1562), Jarnac, and Moncontour (both in 1569), against the Huguenots. In the famous naval battle of Lepanto fought in 1571, Crillon displayed prodigies of valor, and, though wounded, was appointed to carry the tidings of the great victory to the Pope and the king of France. The massacre of St. Bartholomew (1572), the preparations of which had been carefully concealed from Crillon, was loudly reprobated by him. He fought heroically for Henry IV. against the League and distinguished himself at the battle of Ivry (1590), and at the sieges of Paris and Laon.

Crilly, Daniel, Irish journalist: b. 14 Dec. 1857. He edited the 'United Irishman,' Liverpool, 1876, and joined the staff of the 'Nation,' Dublin, 1880. He represented North Mayo in Parliament 1885–1900, and has published: 'In the Byways with Young Ireland' (1888); 'The "Felon" Literature of Ireland' (1889); 'The Celt at Westminster' (1892); 'Pencillings on Parnassus' (1899); 'In the Footsteps of John Mitchel' (1900–1).

Crime, a word signifying in its legal acceptation any act to which the law attaches a penalty or punishment, without any reference to its moral turpitude. To constitute a crime, there must first be an act, since a mere opinion or intention, however wrong from a moral or religious point of view, if not carried into an act, cannot be treated as a crime, although the criminality of the act when done, may be partially or entirely dependent upon the intention of the actor. The true and only reason for making any given act a crime is the public injury that would result from its frequent perpetration. Each individual instance constituting an individual injury, frequent repetition would make it a social injury. Society accordingly takes the most efficient measures for its prevention, by appealing to the fears of mankind. The crime is first accurately defined, and the requisite punishment attached to it, and then government itself becomes a party to the prosecution of the offender, in order to insure the carrying into effect of the penalty; for the certainty of punishment is even more effectual in preventing crimes than any degree of severity with a probability of escape. But while the only legitimate object of punishment is to protect society against a repetition of crimes, humanity dictates that the reformation of the offender should also, if possible, be effected. But as government has no concern with men, except as members of society, it is obvious that their moral improvement can never be made the primary object of punishment. Self-protection is at once the foundation and the end of the power exercised by society in punishing its members. In preventing the repetition of crimes, punishment is designed to operate both upon the individual offender and upon the community at large. Upon the offender himself it operates by physically disabling him from repeating the offense, or by dissuading him from it through the recollection of past suffering, or by both of these means together. Upon the community at large, it operates only by the terror of example. Consequently it follows that the mode and measurement of punishment are to be determined, not so much by the abstract nature of the offense as by its liability to frequent repetition, and also that no act should be punished at all, the repetition of which does not injuriously affect the temporal welfare of society. See CRIMINOLOGY.

Crimea, krī-mē'a or krī-mē'a, **The** (Fr. *Crimée;* German, *Krim;* ancient *Chersonesus Taurica*), a peninsula forming the most southerly portion of the Russian government of Taurida. It has a maximum length, east to west, of 200 miles, and a breadth of 130 miles from north to south, and is estimated to have an area of 10,000 square miles. On the west and south it is washed by the Black Sea and on the east by the Sea of Azof. The coast line is very broken, and the surface is three fourths steppe, with many saline stretches and some excellent pasture land. The other quarter is mountainous, with beautiful scenery and many fertile slopes and valleys. There grapes, olives, and mulberries are grown in profusion and on the northern slope of the mountain range grain fields and orchards are planted. The climate, however, is severe and changeable and the summers are dry. The forests are of limited extent, and seldom contain magnificent timber.

Among domestic animals the first place is due to the sheep, of which there are large numbers of fine-wooled breeds; horned cattle and horses are also reared in large numbers. Of mineral productions the only one of consequence which the Crimea is yet known to possess is salt, which is obtained from lakes in the saline tracts already referred to, in large quantities, and furnishes the material of an active trade, chiefly with the interior, by land transport. The Crimea is now included in the Russian government of Taurida. The chief town and port is Sebastopol, and the population is estimated at about 450,000.

The history of the Crimea extends over 24 centuries, commencing with the earliest annals of Greece. It figures in Greek fable as Cimmeria. Greek settlements were made on the shores of the Crimea in early times; cities were built, one of them Theodosia, which still retains its name. The Bosporus finally became a dependency of Rome, and after the fall of the empire the settlements in the Crimea appear to have had a very precarious existence, at one time placing themselves under the protection of the Byzantine emperors, at another becoming the tributaries of some marauding adventurer, and at another claiming to be their own masters. The time when some offshoot of the Turks first arrived in the Crimea is not well ascertained, but in the 7th century the greater part of it was in the hands of a Turkish tribe called Khazars, and had, in consequence, changed its name to that of Khazaria. In like manner its southern coast, where the Goths had established themselves, was called Gothia. The Crimea formed only a minute portion of the territories of which the Khazars had made themselves masters. Their capital was seated near the mouths of the Volga, probably not far from the present Astrakhan, and their sovereigns, called khazars or khans, lived in a state of splendor which the monarchs of western Europe have seldom equaled. In the 10th century the Russians and Pichengues come upon the scene, and before the end of it the power of the khans is almost broken. The Russian conquests were made chiefly in the north; the Pichengues, on the contrary, make their incursions on the south; and the Crimea, though still retaining the name of Khazaria, was obliged to receive them as its masters. The Pichengues, after maintaining their footing for above a century and a half, were forced to give way to the Comanes, who themselves were, in fact, fleeing before a race much more powerful than either. This was the Mongol Tartars, headed by the celebrated conqueror Genghis-Khan. The Crimea having been included in his conquests, passed, on his death, to his grandson, Batu-Khan, and in 1240 was incorporated in the great empire of the Golden Horde. Batu-Khan was the founder of Baktschi Serai, which continued long to be its capital. Mengli Timur, the second in succession from Batu-Khan, having granted the Crimea to a nephew, to be held as a dependency of the grand khanate, it took the name of Crim, or Little Tartary, from which that which it now bears is evidently derived. Previous to this time the Genoese had frequently visited its shores as traders, but they now applied to the under khan for permission to form a permanent settlement. This was granted, and in consequence in 1280 they founded Kaffa, which is still known by its ancient name of Theodosia. The great object of the Genoese in making this settlement was to exercise a control over the extensive and lucrative trade which was then carried on with the East, by way of the Caspian Sea and the Volga, and thence, after a short land carriage, down the Tanais or Don, into the Sea of Azof. This trade and a large business in slaves so increased the importance of this settlement that the Genoese, who had come as simple traders, began to aspire to be masters. The jealousy of their great rivals, the Venetians, was excited, and open hostilities were carried on, each party contending for an exclusive monopoly of the whole trade of the Black Sea. In this contest the Genoese gained the advantage, and they continued to follow it up by forming permanent settlements, and erecting strong fortifications. In this way they obtained possession of Soldaia, now Soudak, in 1365, and about the same time made themselves masters of Cembalo, which afterward exchanged its name for that of Balaklava. The old castles at both these places are Genoese. While Genoa was thus a rising power, the khans were rapidly declining. To complete their downfall, the terrible Timur appeared, and early in the 15th century the great empire of Kaptschak or the Golden Horde was broken up into fragments. Early in the 15th century the Crimea thus became an independent khanate, and continued so to exist under the line of Gherai, descended from Genghis-Khan, for a succession of reigns. The Genoese in the meantime were growing in power, and succeeded, by interfering in a disputed succession, in gaining complete ascendency over the khanate. The Tartars invited the interference of Turkey, and 1475 an Osman fleet appeared in the Bay of Kaffa. The Genoese offered an ineffectual resistance; and Kaffa, along with all their other settlements, was soon in the possession of the invaders, and the Crimea became a province of the Ottoman empire. The Turks, not satisfied with the Crimea, extended their conquests far into Russia, and provoked Russian reprisals, and soon Russia turned to the Crimea as a possible and valuable maritime province. In 1736 a Russian army of 50,000 men broke through the isthmus of Perekop and made its way into Crimea itself. But the terrible climate forced the speedy return of less than half of the army, all that was left. The contest for the Crimea, thus begun, was steadily persisted in; and the conquest was virtually com-

pleted by the troops of Prince Dolgorouki in 1771. In 1783 the Crimea was united to the Russian empire.

The progress of Russia in this direction naturally held out to her more tempting objects of ambition, and it was generally believed by the western powers of Europe, who were jealous of the growth of her gigantic power, and particularly by England, of whose policy, in consequence of her possessions in the East, the preservation of the Turkish empire had become a primary object, that she aimed at the dismemberment of that empire, and the conquest of Constantinople itself. Among other indications of agressive tendencies, the great naval arsenal of Sebastopol, occupying the most commanding position in the Black Sea, at the extremity of the Crimean peninsula, begun by Catharine II. in 1780, was completed on a scale of which the world has yet seen few examples, and provided to an unlimited extent with all the means both of offensive and of defensive warfare. One main object of this arsenal undoubtedly was to hold out a standing menace against Turkey, and make her destruction certain whenever an opportune period for striking the final blow should have arrived. The Emperor Nicholas, one of the ablest as well as most ambitious of the czars who have ever swayed the Russian sceptre, had satisfied himself that this period was actually at hand. In February 1852 the Porte had given a decision on a dispute between the Latin and Greek churches, the former protected by France, the latter by Russia, as to the protection of the holy places in Palestine, which was deemed favorable to Russia. A new demand, however, was made by this power, which, in November, claimed, in virtue of the Treaty of Kainardji, a protectorate over the Greek Church throughout the Turkish empire. After complicated negotiations, the Porte, under pressure from France, vacillated toward the side of the Latins, and on 22 December delivered the key of the Church of Bethlehem to the Latin patriarch. The diplomacy of England, France, Russia, Austria, Prussia, and Turkey exhausted itself in negotiations over this dispute, and at length, in May 1853, Prince Menschikoff delivered an ultimatum to the Porte, which being rejected, the Russian troops, which had been advanced to the Pruth at the close of the previous year, crossed it and occupied the Danubian principalities. The Porte declared war on 23 Oct. 1853; France on the 27th, and England 28 March 1854. On 26 Jan. 1855 the allies were joined by Sardinia. Happily the common danger had dissipated all the misunderstandings which had arisen between Great Britain and France. Nicholas had selected the Danubian principalities as the scene of warfare, and here the allied army was first conveyed; but after remaining inactive for some time at Varna, it was determined that the Crimea should be made the great battlefield. Accordingly, in the beginning of September 1854, the combined fleets of Great Britain and France, forming, perhaps, when efficiency as well as vastness are considered, the mightiest armament ever conveyed by sea, appeared off the west coast of the Crimea, about 30 miles north of Sebastopol. The disembarkation having been completed on the 16th, the army began to move southward on the 19th, and early on the 20th approached the banks of the Alma. Here the Russian army was found occupying a position which Prince Menschikoff, its commander, believed to be unassailable. After a sharp struggle the Russians were forced to give way at every point, leaving the allies in possession of a victory which is destined to hold an honorable place in military annals. Two days after the allied army continued its march for Sebastopol, the real object of attack; but for strategical reasons, instead of proceeding directly to the north side of the fortress, made a circuit which brought it considerably to the south, in the vicinity of Balaklava. This small harbor, near which the British were stationed, furnished them with facilities for landing the munitions of war, while the same object was gained, perhaps more advantageously, by the French at Kamiesch Bay. It has been alleged that an assault upon Sebastopol, had it been made immediately after the victory of the Alma, would probably have been successful. The defenses were, toward the sea, justly deemed all but impregnable, but those on the land side, from which the czar had never dreamed of the possibility of an attack, were very incomplete. The allies, however, doubting the success of an assault, resolved to proceed in more regular form; and thus commenced one of the most remarkable sieges of modern times. The greatest skill, courage, and perseverance appear to have been displayed both by the besiegers and the besieged. The latter were, however, in almost every respect the more favorably situated. Their munitions of war were almost unbounded; the northern side of the harbor was never invested, so that their communication with the country always remained open; and, contrary to the rule established in regard to siege operations, the number of troops within the town nearly equaled, and at one time greatly exceeded, the number of those who were attempting to take it. The consequence was that not only were defensive works constructed rapidly while the siege made comparatively little progress; but the besieged, who had also the assistance of an army without the walls, were able to assume the aggressive. On 25 October took place the famous battle of Balaklava, distinguished by the heroic charge of the Light Brigade, when, in consequence of the misinterpretation of an order, 600 cavalry rode headlong against the Russian army. On 5 November followed the battle of Inkermann, in which an overwhelming force of Russians was gallantly repulsed. Both Great Britain and France now became more alive to the magnitude of the struggle in which they were engaged. While the siege continued, other important positions in the Crimea were occupied, and the possession of Eupatoria on the west, and of Kertch on the east, both seriously threatened the communications of the Russians, and furnished the means of destroying a large portion of their supplies. The peninsula was thus virtually conquered, and a successful issue of the siege began to be confidently anticipated. At an early period the Russians, by sinking a number of large ships across the mouth of the harbor, had rid themselves of the danger of an attack by sea. The remainder of the fleet within the harbor was still available for defense, and, from its powers of locomotion enabling it to change its position so as to meet emergencies, was able greatly to retard the besiegers. Decided progress, however, continued to be made. On 7 June 1855 the Mamelon, a commanding

height, was taken; and on 8 September the flag of the allies waved on the tower of the Malakoff. The Russians on the night of the above day, aware that further defense was impossible, withdrew to the northern side of the harbor, after sinking their ships and blowing up the defenses of the town, which was now taken possession of by the allies. There is no reason to doubt that in another campaign the Russians might have been driven entirely out of the Crimea; but overtures of peace were made, and they gladly availed themselves of them. A treaty of peace was concluded at Paris on 27 April 1856, by which the independence of the Ottoman empire was guaranteed, and her admission to the society (concert) of European powers declared by the other contracting parties, namely, Great Britain, Austria, France, Prussia, Russia, and Sardinia; the Christians in Turkey to remain under the protection of the Sultan, who, by, a firman, allowed them religious liberty; the waters of the Black Sea declared neutral, and only light vessels for coast service allowed to be maintained there; the emperor of Russia and the Sultan not to maintain any military-maritime arsenal on the shores of the Black Sea. Taking advantage of the Franco-German war, Russia, on 31 Oct. 1870 denounced the Treaty of Paris so far as it related to the neutralization of the Black Sea, and in a conference held in London in January 1871, this part of the treaty was given up, while the remainder of the treaty was confirmed. Consult: Telfer, 'The Crimea and Transcaucasia' (1872); Wood, 'The Crimea in 1854 and 1894' (1895); and, for the Crimean war, Kinglake, 'The Invasion of the Crimea' (1863–87), and Hamley, 'The War in the Crimea' (1891).

Criminal Law. See LAW, CRIMINAL.

Criminology, the science dealing with crime and the criminal population. Criminology may be divided into three branches: general, special, and practical. General criminology consists in a summary and classification of results already known and is historical in character. Special criminology is confined to the study of individual criminals, employing the methods of science with instruments of precision. Practical criminology treats of methods and institutions for the prevention or amelioration of crime, including a study of prisons, reformatories, police systems, and criminal law as applied to society. It is in special criminology that most interest of late has been shown; this branch is pervaded with the scientific spirit.

The study of criminals has been theoretical. At present our jurists study law books, not criminals, and yet nearly one half the time of our courts is given to criminals. The individual study of the criminal and crime is a necessity, if we are to be protected from ex-convicts — the most costly and most injurious citizens we have. A complete study of a criminal includes his history, genealogy, and all particulars concerning himself and his surroundings previous to and during his criminal act; also a study of him in the psycho-physical sense — that is, experiments upon his mind and body with instruments of precision — measuring, for example, his thought-time, sense of sight, hearing, touch, taste, smell, pressure, heat, and cold; also an examination of his organs after death, especially of his brain. It is evident that no one person could make an adequate study of a criminal. The microscopical anatomy of the brain alone, with its physiology, is more than the lifework of many men could accomplish. Criminology, therefore, depends for its advancement upon the results of numerous departments of investigation.

In a rigid sense criminology is no more a science than sociology. Like many other branches of study, they are called sciences by courtesy. But the empirical study of human beings, with whatever class it begins, is an important step toward a scientific sociology. Criminology is an initiatory step in the direct study of individuals themselves and their exact relations to their surroundings. The practical and scientific value of such study consists in showing more clearly what normal society is or ought to be, just as the study of insanity gives by contrast an insight into mental health.

As already indicated, knowledge of the criminal's brain, as well as of the brain in general, is very inadequate, so that any definite conclusions are unwarranted. It may be said that the fact of a criminal having mental anomalies and at the same time cerebral or cranial ones, does not show that either one is the cause of the other, although it may justify a presumption that they are in some way related; for such conclusions are based upon the anatomy rather than the physiology of the brain; as to the latter little is known. It is easy to conceive that brain circulation, qualitative, and quantitative, has as much to do in its effect on the mind as anatomical conditions. It is, however, reasonable to assume that every physiological irregularity is based upon an anatomical one; yet the reverse may be assumed also. The probability would seem to be that the physiological and anatomical mutually act and react, one upon the other. To decide which is primary is wholly beyond our present knowledge.

Criminals are not so abnormal as is generally supposed. Probably nine tenths of prisoners are criminals by *occasion;* that is, their crime is due mainly to bad social conditions; their personality differs little or none at all from that of average man, so that many results gained here relate to normal man. Questions can be asked and investigations permitted in prison that would be difficult with normal man outside of prison. The prisoner has much less to lose, and will often make confessions that few outside of prison would care to make, giving the deepest insight into human nature. The exact conditions, such as regularity in habits of life, diet, etc., are known, and thus a more favorable condition of scientific inquiry is afforded. This is especially true in reformatories, industrial schools, houses of refuge, etc.; most of the inmates are entirely normal; it is abnormal surroundings, such as poverty or drunkenness at home, that brought them here, and not abnormal natures in the children themselves. But it may be added that if children remain long enough in such conditions they will be liable to develop whatever criminal tendencies are in them. It is generally admitted that about 10 per cent of inmates are incorrigible; that is, they are criminals by nature. As their incorrigibility is shown by repeated acts, it is not so difficult to select these cases. This is not saying that such and such a case can not be cured, but intelligent prison officials of long experience doubt the probability of reformation. This fact of incor-

rigibility may be a reason why crime has been considered a disease. Reports from the principal penitentiaries of this country show 82 per cent in good health, 11 per cent in fair health. If crime is a disease, it would seem that it has little to do with what is ordinarily designated under this term. Some have sought by the study of criminals' brains to show anatomical anomalies indicating disease; but there is little agreement in these investigations. But if there were agreement, it would only indicate probabilities, not certainties, for comparatively few brains of criminals have been studied. Even in the case of the insane it is not demonstrated that mental disease necessarily involves brain disease; yet most investigators believe that it does, and with good reason. But there have been cases of insanity in which cerebral anomalies have been sought for in vain.

When the cause of a particular crime is found, this may indicate the most active cause, but not the only one. There may be specific remedies for specific cases, but they can only be determined by special study of the individuals. While some cases can not be reached, the great majority can be made susceptible to reformation, or at least improvement. Often the truest and best advice a physician can give to his patient is to keep up the general health, and nature will be his best servant in resisting all attacks of disease. The same principle applies in aiding one to overcome temptations to evil or crime. Such a remedy consists in moral and intellectual habits being implanted in children, which will give a constant resistance to all temptation, and be even an unconscious force when self-control is lost. Little can be expected from palliative remedies as long as this educational remedy is not thoroughly carried out.

It is an undisputed fact that the moral side of education is as difficult as it is important. This becomes most apparent in the education of the dependent, weak, and criminal classes. Any educational system that can succeed here can with slight modification succeed in the community at large, for all men have tendencies, however slight, toward these defects; but, by force of character or surroundings, the great majority have been able to resist to such a degree as not to fall. But it may be asked to what extent methods of education for normal individuals may be adapted to those who are abnormal. An individual may be said to be abnormal when his mental or emotional characteristics are so divergent from those of the ordinary person as to produce a pronounced moral or intellectual deviation or defect. To distinguish such abnormality from disease is difficult, if not impossible; but in general an abnormality is called disease as soon as it reaches a certain degree; but it may also be an excessive degree of the normal, just as in the physical man in a single diseased cell the normal or physiological processes are not changed in kind, but only in degree, or simply act at an inappropriate time.

The purpose of criminological study is to seek out the causes and conditions that lead to crime, on the general principle that the amelioration or prevention of evil doings can not be accomplished by rational methods until we know more definitely the causes, whether they lie more in the individual or more in the surroundings. As far as investigation of criminals has gone, the indications are that the cause of most crime lies in the surroundings, rather than in the criminal, and this is a most hopeful result of such study, because it is possible to change the surroundings, but very difficult to change the nature of an individual. The study of a single criminal in the most thorough manner possible is important from the fact that he represents generally a large number in his type, and in this way a clear insight is gained into the definite nature of those characteristics and special surroundings which lead through their combination into evil doing.

One method of criminology is to study a few cases as thoroughly as possible. In a new field of empirical study the investigation of details is indispensable, if there is to be any attempt at scientific treatment. The reader may, in addition, gain an independent insight into typical cases and the method of treatment in our penal institutions. The value of a single case lies in the fact that repetition is the rule in crime. And for this reason the study of single cases is probably the best method of gaining a definite knowledge of the causes, difficulties, and remedies for crime. The method of gathering the facts is by visiting different reformatories and prisons. One aim is to study only those cases about which enough is known to place their real nature beyond a doubt. We should give in detail the complaints and other records of each case investigated, with the additional testimony gathered from the officers. These facts are of more scientific value than those gathered outside of prison, because they are not only more trustworthy, but the environment of the prisoner is more definitely known. Each complaint generally represents many repetitions of the same offense, for an officer naturally refrains from making complaints, as he may get the ill will of the prisoner, which adds difficulties to the duties of both.

The modern school of criminal anthropology or criminology, holds in general the following principles:

1. Criminology has as its purpose the study of the actual criminal and his crimes as ordinary phenomena, which must be investigated from their genesis to their final development.

2. The law of retaliation must be abandoned; the basis of punishment is the necessity of protecting society. The criminal must be reformed, or he must be separated from society. Punishment is not to satisfy vengeance.

3. In crime the results of two factors are seen reciprocally acting: first the individual peculiarities arising from the nature of the criminal or his psycho-physical organization; second, the peculiarities of external influences, as climate, nature of country and social surroundings, nationality.

4. The causes of crime may be divided into: (*a*) immediate, which arise from the character of the criminal; (*b*) remote, which are hidden in his unfavorable environment, under which organic tendencies are developed.

As an illustration of the study of criminals with instruments of precision, the temporal algometer is given. This instrument (designed by the writer) is pressed against the temple, and as soon as the pressure is felt to be the least disagreeable, the amount of pressure is read on the scale (E). Criminals of the brutal type especially are found to be less sensitive to pain than persons in general.

Criminal Hypnotism.— Almost all the crimes committed by hypnotizers on those hypnotized are violations or outrages of modesty. In the lethargic or cataleptic state the subject is easily influenced; here also somnambulism offers some dangers. The affective sentiments toward the hypnotizer are strongly manifested in many cases; the subject, isolated from the entire world, only sees the hypnotizer. It is easy to comprehend the danger to one in a mental state like this. At this point the actions of a person might seem involuntary, and so not constitute a crime, but the hypnotizer or magnetizer who profits in the somnambulism from similar dispositions of mind is guilty of the crime of violation. In the state of lethargy one does not remember on awakening what transpired in this stage of the sleep, or the recollection is so confused that the testimony can not be trusted. There is also a lucid lethargy, a still less degree of hypnosis. This state is important when the question of simulation arises, but in this state the recollection can generally be trusted. In some cases of violation the victim passes from lucid lethargy to complete lethargy; certain things are remembered, while others are confused or forgotten. Somnambulism can serve for the committing of a voluntary abduction one might say; the individual is plunged into lethargy, and his totally unconscious state serves to carry him away. Certain magnetizers of India were accustomed to employ this means to rob children. But the danger from criminal hypnotism has been exaggerated. While it may afford ways of committing crime, it likewise involves circumstances by which the criminal may be discovered.



Temporal Algometer (Macdonald).

It would carry us too far to enter into any discussion of criminal hypnotism. As one might expect in a subject so recent in its scientific treatment, the question of criminal hypnotism is somewhat indefinite, sometimes contradictory and generally unsatisfactory. As is well known, the older or Paris (Charcot) school maintained that hypnotism is a pathological symptom; while the newer or Nancy school (Liébault, Bernheim) asserted that it is physiological. While the Paris school seems to have receded from its position as to hypnotism in general, it denies criminal hypnotism. But such denial does not come from those who have made extensive experiments on the criminological side.

As to the directly practical side of crime and its prevention, the state has made and is making experiments. But sociological experience of this nature requires much time and numerous tests in order to warrant trustworthy conclusions, and at best they are tentative in nature, for social science is in its formative period. As to the scientific study, cure and prevention of crime, it may be said, in brief, that the method of the scientific study of criminals is a thorough investigation of the criminal himself, both psychologically and physically, so that the underlying and constant cause of crime can be traced out. There is no other rational road to the prevention and repression of crime. Whatever the remedy the causes must be studied first. Negative results are as important as positive, to science. If it should be shown that some crime is incurable, that would be valuable to know, especially what degree of reformation can be expected. If, as Lombroso thinks, crime is to return to the primitive and barbarous state of our ancestors, the criminal being a savage born into modern civilization, then for such there is very little reformation. But these are criminals by nature and constitute a very small proportion — less than one tenth probably. The French school of criminology has shown that the greater part of crime arises out of social conditions, and hence is amenable to reformation by the changing of these conditions.

Education, in the narrow sense of mere intellectual instruction, is not sufficient to reform children who spend one fourth of the day in school, and three fourths on the street, or with criminal, drunken, or idle parents. But are there not reform schools? Yes; but no provision has been made for the little children. Not a few of the inmates of reformatories come there practically incorrigible, and the testimony of prison wardens is that some of the most hopeless prisoners are graduates of the reform schools. The fault is not in the reform schools, but in allowing children to live the first years of their lives in surroundings that almost predestine to crime. Reformatories are expected to erase the indelible criminal impressions made upon children from birth, or before, till the age of six. Instead of deserving criticism, the wonder is that reformatories do as much as they do. In brief, it is useless to expect any great decrease in crime, especially habitual crime, until very young children are properly cared for — that is, until they receive the moral and social education of a home or home-like institution. This is the foundation of all prevention of crime. But much remains to be done after a child has had this good start, for there are still dangers of falling into crime. The method of prevention, from this stage on, consists in moral, mental, and physical training, producing fixed habits. The criminally inclined are especially weak in moral impulse, and below the average in intellect and physique. The education of the will is the main factor, but the training of the intellect and sentiments are necessary to this end. The remedy, therefore, for crime must be general, gradual, and constant. Every reformatory is a school in which emphasis is laid upon moral and industrial habits, which in the young become, as it were, a part of their nervous organization. This is shown by the fact that moral individuals, when hypnotized, unconsciously resist evil suggestions. When passion, perplexity, or temptation cause the loss of self-control, then it is that good habits implanted in childhood and woven into the constitution overcome evil and criminal impulses. All prisons should be reformatories. All men, no matter how old in crime, can at least be improved and benefited — that is to say, the best prisons of the future will be reformatory prisons, and the main means of reform will be the inculcation of good mental, moral, physical, and industrial habits.

The following statements as to the criminal are not based upon experimental research so much as upon the experience of those who have

studied criminals directly or who have had practical control of large numbers in prisons or reformatories:

1. The prison should be a reformatory and the reformatory a school. The principal object of both should be to teach good mental, moral, and physical habits. Both should be distinctly educational.

2. It is detrimental, financially, as well as socially and morally, to release prisoners when there is probability of their returning to crime; for in this case the convict is much less expensive than the ex-convict.

3. The determinate sentence permits many prisoners to be released who are morally certain to return to crime. The indeterminate sentence is the best method of affording the prisoner an opportunity to reform without exposing society to unnecessary dangers.

4. The ground for the imprisonment of the criminal is, first of all, because he is *dangerous* to society. This principle avoids the uncertainty that may rest upon the decision as to the degree of freedom of will; for upon this last principle some of the most brutal crimes would receive a light punishment. If a tiger is in the street, the main question is not the degree of his freedom of will or guilt. Every man who is dangerous to property or life, whether insane, criminal, or feeble minded, should be confined, but not necessarily punished.

5. The publication in the newspapers of criminal details and photographs is a positive evil to society, on account of the law of imitation; and, in addition, it makes the criminal proud of his record, and develops the morbid curiosity of the people; and it is especially the mentally and morally weak who are affected.

6. It is admitted by some of the most intelligent criminals, and by prison officers in general, that the criminal is a fool; for he is opposing himself to the best, the largest, and the strongest portion of society, and is almost sure to fail.

7. It may be said, with a few exceptions, that within the last 30 or 40 years there has been an increase (relative to population) in crime, suicide, insanity, and other forms of abnormality. This is the general verdict of the official statistics of the leading countries of the world.

The objection is frequently made that this relative increase in crime, etc., is due to the more stringent methods of gathering the data. While doubtless this has weight, yet how much it has had to do with the increase is a matter of opinion. In the judgment of those who have spent their lives in dealing first hand with these forms of abnormality better methods of inquiry will not account for the increase. It would seem that this increase is due more to the rapid development of the world in general, rather than to any specific cause.

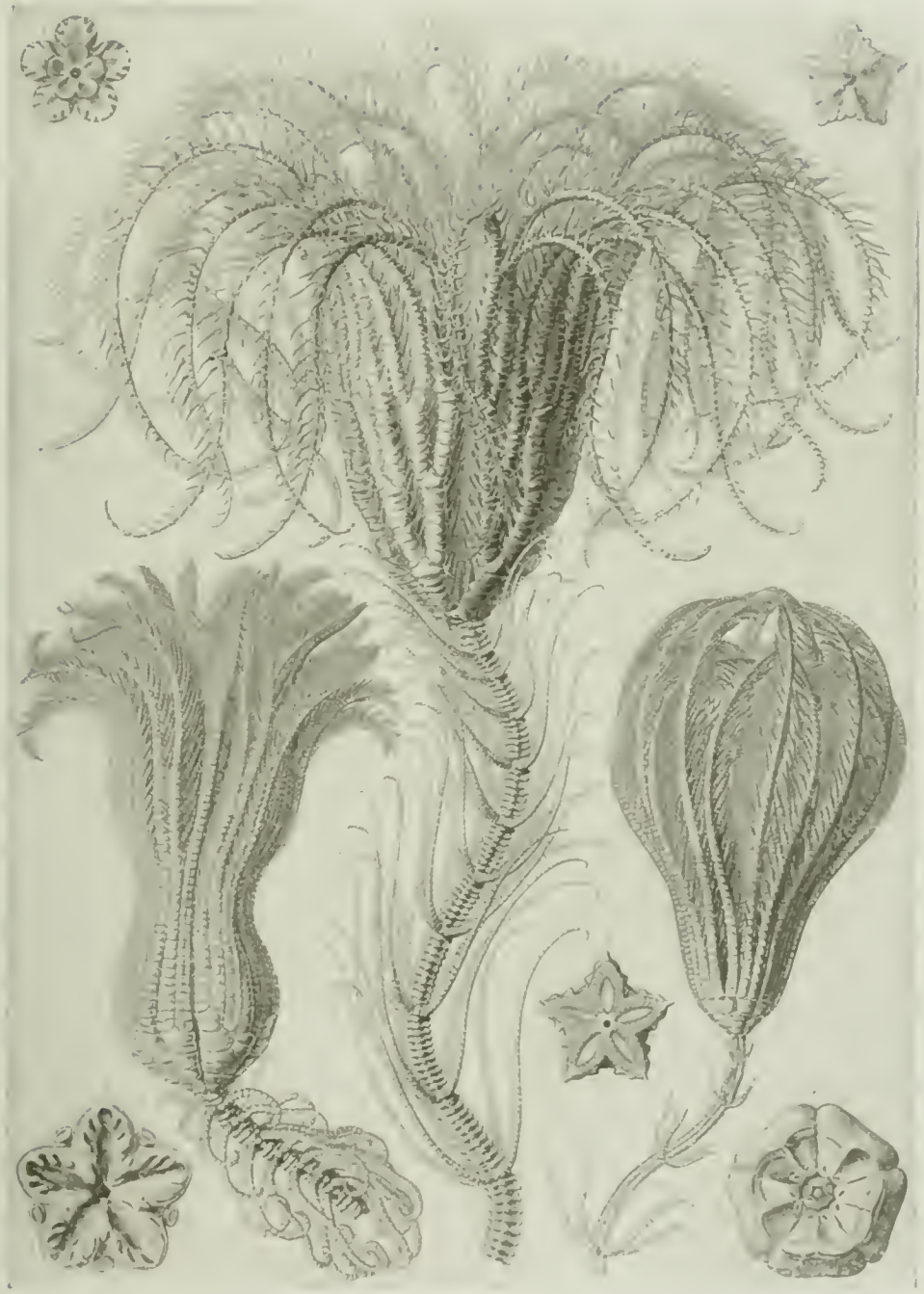
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Crimp, an agent who for a commission supplies ships with seamen, the term being applied especially to low characters who decoy sailors by treating them, advancing money to them, and giving them goods on credit, till they have them in their power, frequently getting them shipped off in a drunken state after all their money is spent. They also keep an outlook for emigrants, and take them to low lodging houses, in which they themselves are interested.

Crinan (krē'nān) **Canal**, a canal in Argyleshire, Scotland, joining Loch Crinan and Loch Gilp, cutting off the peninsula of Cantyre from the mainland, and greatly shortening the route from Glasgow to Oban and other parts of the west coast. It is 9 miles long 12 feet deep, and admits vessels of 200 tons. The canal was completed in 1801, having cost more than $900,000.

Crinoid, krī'noid, or **Sea-lily**, a stalked echinoderm usually fixed by a jointed stem so as to have a flower-like form. The body is more or less cup shaped, with five jointed flexible arms subdivided into branches, and bearing pinnules. The arms may be absent in the blastoids (*Pentremites*) and certain cystideans, but the pinnules remain. There are few existing species, the greater number (nearly 1,000) having become extinct. The most typical crinoid is *Pentacrinus*, which lives attached to rocks in the West Indies at all depths from 20 to 3,000 fathoms; it is about a foot high, the arms much subdivided, the joints of the stem five-sided. In one fossil species the stalk was more than 50 feet long. Crinoids often grew in dense forests. A curious little living crinoid is a slender simple form about two inches high, which lives at the depth of from 100 to 1,000 fathoms on the coast of Norway and in the Straits of Florida in the cold water under the tepid Gulf Stream. It is a survivor of the Cretaceous Period. A north Atlantic shoal-water form is the *Antedon* (*Comatula*), which in its early youth is fixed to the bottom by a stalk, but which becomes free when mature; it also inhabits the Mediterranean Sea. The existing crinoids, more than 200 species, are merely the remnants from a much larger assemblage of fossil forms, which began to live in the Cambrian, culminated in the early Paleozoic Age, and began to decline toward the end of that period. They flourished in greatest numbers about paleozoic coral reefs in shallower water than at present. The most famous American crinoid beds are those of the Subcarboniferous limestones of Burlington, Iowa, and Crawfordsville, Indiana. Thick beds of crinoidal limestones were deposited in various parts of the world at various periods and under favorable conditions from the Ordovician to the Jurassic Period, those of the Carboniferous and of the upper Muschelkalk, the lower beds forming the so-called Trochitenkalk, being especially characteristic, and consisting almost wholly of stems of *Encrinus liliiformis*, the "sea-lily." Crinoids are divided into three classes. The oldest, most generalized and primitive appears to be the class *Cystoidea*. These were more or less spherical in form, either with imperfectly developed arms, or without, and stalked or not. About 250 species are known. They date from the Cambrian Period, culminated in the Ordovician and Silurian Period, then suddenly diminished in numbers, finally dying out before the close of the Permian. The second



CRINOIDS.

1. Metacrinus angulatus. 2 Pentacrinus Macleayanus. 3 Pentacrinus Wyville-Thompsonii
4, 5, 6. Sections of No. 3 showing formation of structure. 7, 8 Sections of No. 2 showing formation of structure

class is the *Blastoidea*, or bud-shaped crinoids, represented by *Pentremites*, which were short-stemmed or entirely stemless. The arms are short, recumbent, and apparently soldered to the calyx or body. These have not yet been detected in strata lower than the Silurian and the type became most numerous in the Sub-carboniferous limestones of the United States. Upward of 120 species are known. The third class is *Crinoidea* proper. The three classes are arranged under the sub-branch, *Pelmatozoa*. Consult: Zittel-Eastman, 'Text-book of Palæontology' (1900), which contains full bibliographies.

Crin'oline (Fr., from Lat. *crinis*, hair), properly a kind of fabric made chiefly of horse-hair, but generally applied to a kind of petticoat supported by steel hoops, and intended to distend or give a certain set to the skirt of a lady's dress. Hooped skirts are by no means a new invention of fashion, a somewhat similar monstrosity, supported by whalebone, being worn in the time of Queen Elizabeth and James I., and the fashion being again introduced in the time of George II. The earlier hooped petticoats were called fardingales or farthingales. The crinoline proper came in about 1856, and was worn by women of all ranks, and sometimes reached portentous dimensions, so as to be not only very inconvenient to the wearer and all coming in contact with her, but also the cause of accidents from fire, etc. The immense bell-shaped crinolines fell into disuse about 1866. Crinoline wire was for years a leading branch in the steel trade. A horse-hair and cotton fabric used as a material for making ladies' bonnets is also called crinoline.

Crinum, kri'nŭm, a genus of bulbous-rooted herbs of the natural order *Amaryllidaceæ*. The numerous and widely distributed species are characterized by rather broad, usually persistent leaves, and umbels of few to many funnel-shaped flowers, often deliciously fragrant. The flowers are usually pure white, with bands of purple or red, or tinted throughout with one of these colors. Several species are widely popular as greenhouse specimens and in the warm South and California as outdoor subjects on lawns. *C. americanum*, the Florida swamp lily, is common in wet ground in the Gulf States. *C. longifolium* and *C. moorei* are somewhat hardy, the former as far north as Washington, the latter not quite so far. Both these species blossom continuously through the summer; the others generally have a short season of bloom. More than 20 species with many horticultural varieties are cultivated in American gardens and greenhouses. They differ widely in their demands as to cultivation, for an account of which, and also for a description of the popular species, consult: Bailey, 'Cyclopedia of American Horticulture' (1900–2).

Cripple Creek, a town in El Paso County, Col.; on the Florence & Cripple Creek and the Midland Terminal railroads, 50 miles west of Colorado Springs. It is the trade centre for the Cripple Creek mining district, in which the output of gold in the first half of 1902 was $13,936,302, and the total production of the camp to 1 Jan. 1902 was $116,549,287. The total dividends to 30 June 1902 amounted to $25,817,051. The town has several cyanide mills, smelters, and other mining industries, a national bank, and daily and weekly newspapers. It was founded in 1890, and was nearly destroyed by fire in 1896. Pop. (1900) 10,147.

Crisis, in medicine, the turning-point in a disease at which a decided change for the better or the worse takes place. In regular fevers the crisis takes place on certain days, which are called critical days (the 7th, 14th, and 21st); sometimes, however, a little sooner or later, according to the climate and the constitution of the patient. The word crisis is also figuratively used for a decisive point in any important affair or business, for instance, in politics and commerce. Commercial crises have been in an especial degree the subject of study at the hands of economists, with the result of establishing a curious periodicity in their recurrence. The commercial cycle apparently completes itself in about 10 years, the earlier portion of the period being attended with improving trade, a steady rise in prices, wages, and profits, and a considerable inflation of credit. Excitement, over-trading, and unwise speculation result in serious failures, and there follows a period of distrust and distress.

Crisis, The, the general name given to a series of political articles by Thomas Paine. These are 13 in number, exclusive of a 'Crisis Extraordinary' and a 'Supernumerary Crisis.' The first and most famous, published in the 'Pennsylvania Journal,' 19 Dec. 1776, began with the famous sentence, "These are the times that try men's souls." "It was written during the retreat of Washington across the Delaware, and by order of the commander was read to groups of his dispirited and suffering soldiers. Its opening sentence was adopted as the watch-word of the movement on Trenton, a few days after its publication, and is believed to have inspired much of the courage which won that victory." The 13th, published 19 April 1783, bears the title, 'Thoughts on the Peace, and the Probable Advantages thereof.' It opens with the words, "The times that tried men's souls are over." The pamphlets throughout exhibit political acumen and the common-sense for which Paine was remarkable. As historical evidence of the underlying forces in a unique struggle, and as a monument to patriotism, they possess great and lasting value.

Crisp, Charles Frederick, American jurist: b. Sheffield, England, 24 Jan. 1845; d. Atlanta, Ga., 23 Oct. 1896. He came to the United States when a child, served in the Confederate army 1861–4; was admitted to the bar in 1866; was solicitor-general of Georgia from 1872 to 1877; and judge of the supreme court 1877–82. He resigned the last office to accept a nomination for Congress, of which body he was chosen speaker in 1891, and again in 1893.

Crispi, Francesco, Italian statesman: b. Ribera, Sicily, 4 Oct. 1819; d. 11 Aug. 1901. He studied law at the University of Palermo and settled at Naples in 1846. Since then he has been an important factor in Italian history. He took part in the conspiracies that led to the overthrow of the Two Sicilies, after which he fled to France for a time; served as a major under Garibaldi in 1860, and in 1861 was returned by Palermo to the first Italian parliament, and became president of the Chamber of Deputies in 1876. He was made minister of the in-

terior in 1877, was prime minister 1887–91, and again 1893–6. He was a warm friend of Bismarck and a staunch supporter of the triple alliance of Italy, Germany, and Austria. He became unpopular with the people on account of taxation, and two attempts were made to assassinate him. See Stillman, 'Francesco Crispi: Insurgent, Exile, Revolutionist, and Statesman' (1899).

Crispin and **Crispinian, Saints,** two Roman brothers who suffered martyrdom in one of the general persecutions of the Christians in the Roman empire, either in the year 287 or 300. The legend attached to their names recites that the brothers, in the company of St. Denys, journeyed from Rome to Augusta Suessionum (Soissons) in Gaul, preaching the Christian religion; and after the example of Paul the apostle, lest they should be a burden to anyone, earning their livelihood by exercising their craft of shoemaking. They sold their wares to the poor at a very low price, and well they might, for the raw material cost them nothing, being provided for them gratis by the ministry of angels. A variant of the legend, conceived in a not unusual vein of popular humor would have it that the brothers stole the leather that they might practise a larger charity. The chief magistrate of the town, having learned of the great success of the volunteer evangelists in making converts to Christianity, had them brought before him and, after torture, they were beheaded. The brothers were thereafter regarded as the patron saints of the shoemakers' guild; but, as in the case of Castor and Pollux, one of the pair, Crispin, enjoys alone all or most of the posthumous homage.

Crit'elaus. (1) A celebrated Archæan demagogue, who incited his countrymen to insurrection against the Romans. He commanded the Archæan army at the battle of Scarphæa, 146 B.C., and when overthrown by Metellus, either committed suicide or perished in the marshes of the coast. (2) Greek philosopher of the 2nd century B.C. He was at the head of the Peripatetic School in Athens and eminent as an orator. With Carneades he was despatched on an important embassy to Rome about 155 B.C.

Critias, krit'i-as, Greek orator: d. 404 B.C. He was one of the 30 tyrants set over Athens by the Spartans. He applied himself with great success to the culture of eloquence, which he had studied under Gorgias, and Cicero cites him among the public speakers of that day. Banished from Athens for some cause that is not known, he retired to Thessaly, where he incited an insurrection among the Penestæ or serfs. Subsequently to this he visited Sparta, and wrote a treatise on the laws and institutions of that republic. Returning to Athens with Lysander, 404 B.C., he was appointed one of the famous 30, his pride of birth and hatred of demagogues having pointed him out as a fit person for that office. After a cruel and oppressive use of the power thus conferred upon him, he fell in battle against Thrasybulus and his followers. Plato, who was a relation of his, has made him one of the interlocutors in his 'Timæus and Critias.'

Substance	Formula	Critical Temperature	Critical Pressure (Atmos.)
Acetic acid	$C_2H_4O_2$	+ 321 C.	57.
Acetone	$(CH_3)_2CO$	+ 233.	52.
Acetylene	C_2H_2	+ 37.	67.
Alcohol	$C_2H_5.OH$	+ 244.	64.
Ammonia	NH_3	+ 131.	113.
Carbon dioxid	CO_2	+ 31.	77.
Carbon monoxid	CO	— 139.	35.5
Chlorine	Cl	+ 146.	93.5
Chloroform	$CH.Cl_3$	+ 268.	54.9
Cyanogen	CN	+ 124.	61.7
Dimethylamine	$(CH_3)_2NH$	+ 163.	56.
Ethane	C_2H_6	+ 35.	45.2
Ethyl acetate	$C_2H_5O.C_2H_3O$	+ 250.	39.6
Ethylene	C_2H_4	+ 10.	51.
Ethyl ether	$(C_2H_5)_2O$	+ 194.	35.6
Hydrochloric acid	HCl	+ 52.2	83.
Hydrogen	H	— 234.	20.
Methane	CH_4	— 81.8	54.9
Methyl alcohol	$CH_3.OH$	+ 232.8	72.8
Methylamine	$CH_3.NH_2$	+ 155.	72.
Methyl chlorid	CH_3Cl	+ 141.5	73.
Methyl ether	$(CH_3)_2O$	+ 130.	59.
Nitrogen	N	— 146.	35.
Nitrogen dioxid	NO	— 93.5	71.2
Nitrogen monoxid	N_2O	+ 36.4	73.1
Oxygen	O	— 119.	50.8
Phosphoretted hydrogen	PH_3	+ 52.8	64.
Sulphur dioxid	SO_2	+ 155.6	79.
Sulphuretted hydrogen	H_2S	+ 100.	90.
Trimethylamine	$(CH_3)_3N$	+ 160.	41.
Water	H_2O	+ 365.	200.

Critical Angle. See Light.

Critical Point, in physics, the state that a gas is in, when its temperature is the "critical temperature," and its pressure is the "critical pressure." It was formerly believed that any

gas could be liquefied, if a sufficient pressure were brought to bear upon it. It was known that reduction of temperature facilitates liquefaction, but it was nevertheless believed that a sufficient pressure would effect the liquefaction at any temperature whatever. Dr. Thomas Andrews, in the Bakerian Lecture for 1869, entitled 'On the Continuity of the Gaseous and Liquid States of Matter' (see 'Philosophical Transactions' for 1869, Pt. II., p. 575), showed that this view is erroneous, and that there exists for every gas a temperature above which it is impossible to liquefy the gas by the application of any pressure whatever. The temperature so defined is called the "critical temperature"; and the vapor tension that a liquefied gas exerts at its critical temperature is called the "critical pressure" of the gas. Similarly, the volume occupied by a unit mass of a gas that is at its critical point is called the "critical volume" of the gas. The critical constants of the various gases and liquids have not yet been determined with as much precision as could be desired. Generally speaking, the critical temperatures are best determined. The critical pressures come next in order of accuracy, though many of the values of these that are now accepted are without doubt materially inaccurate. The experimental determination of the critical volume of a gas is exceedingly difficult, and few of the critical volumes are known with any approach to precision. The table on the preceding page gives some of the values of the critical constants of gases that are provisionally accepted by physicists. The critical temperatures are given on the centigrade scale, and the critical pressures in atmospheres.

One important and curious fact that follows from the existence of a critical point is that the gaseous and liquid states of a given substance may be regarded as continuous with each other, inasmuch as it is possible to cause a substance to pass from one of these states to the other by a continuous process, and without any abrupt change of condition such as is apparent when ordinary condensation takes place. For example, if we heat a cubic foot of carbon dioxid gas up to 50° C., we can then compress it all that we please without producing the least sign of liquefaction; because the critical temperature of this gas is 31° C., and hence liquefaction cannot be induced at any temperature higher than 31° C. Let us now compress it at this temperature until its pressure is (say) 150 atmospheres. It is still a gas, for the reason just given. Finally we cool the gas, still maintaining its pressure at 150 atmospheres, until its temperature becomes 15° C. There can be no doubt that it has now become liquid, and in fact actual experiment proves this to be the case. If the temperature had been maintained at 15° C. throughout it would not have been possible to compress the gas into the liquid condition without a visible, discontinuous passage from the one state to the other; but by the process described above it is possible to convert the substance from the gaseous state into the liquid state in such a manner that the transition is imperceptible to the senses, and is not accompanied by any sudden change of density. For further discussion of the theoretical principles involved in the consideration of the critical state, see MOLECULAR THEORY; THERMODYNAMICS. Consult also: Maxwell, 'Theory of Heat'; Preston, 'Theory of Heat.'

Criticism, the expression of a judgment concerning any subject; specifically the formulating of opinions based upon certain principles, in matters of art, literature, philosophy, etc. Certain canons apply in a general way to all criticism, but each branch has its own particular methods and standards. In its narrow sense, the art of criticism is confined to the study of the beauties or defects of some particular work; in its broadest aspect it includes the establishment as well as the application of principles, for the determination of which it must be largely indebted to philosophy. Aristotle was the first writer to develop a philosophy of criticism, applying it to the study of rhetoric and poetry. In connection with the truth that poetry deals more with "universals" and history with "particulars," he assigns a higher rank to the former and brings out a fundamental distinction pointing to the crucial test for any high performance in art or literature. A work cannot permanently contribute inspiration and enjoyment, without possessing those elements which arise from the essentially and universally human, as contrasted with individual or temporary characteristics. The Augustan Age produced one critic that the world of letters could ill spare. To Horace the art of criticism owes much of permanent value and perennial charm. The traditions of culture, forgotten or dormant during the Middle Ages, and revived by the leaders of the Italian renaissance and the humanists, for a long time produced little that was broad, fundamental, or independent in criticism. In France, Boileau, Voltaire, and others led the way; and Germany is indebted to Lessing for a remarkable impulse given to this province of intellectual effort. Goethe, Schiller, and Schlegel and his brother continued the work. The critical method was effectively applied to history, philology, and science. Without, however, dwelling upon the array of profound and brilliant scholarship displayed in these departments of criticism, but confining the outlook to the field of literature and art, there may be noted among French writers, Taine, Sainte-Beuve, and more recently Brunetière; in England,— Pope, Dryden, Coleridge, Hazlitt, Macaulay, Ruskin, Carlyle, Pater, Matthew Arnold, and Saintsbury; and in America,— Emerson, Ripley, Lowell, Curtis, and Stedman.

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Critique of Pure Reason. See KANT, IMMANUEL.

Crito, krī'tō, Greek philosopher. He was a friend and disciple of Socrates, whom he is said to have supported with his fortune. He made every arrangement for the escape of his master from prison, and used every argument which ingenuity or affection could suggest to induce him to save his life by fleeing from his persecutors. His eloquence was, however, in vain, and Socrates drank the fatal cup. Crito

is a prominent interlocutor in one of Plato's dialogues, which is named after him. He was himself a voluminous writer on philosophical subjects, but all his writings have perished.

Crittenden, George Bibb, American military officer; b. Russellville, Ky., 20 March 1812; d. Dansville, Ky., 27 Nov. 1880. He was graduated at the United States Military Academy in 1832, and served as an officer in the Mexican war, rising to the rank of lieutenant-colonel. He joined the Confederacy at the outbreak of the Civil War, became a major-general, and suffered defeat at Mill Spring, Ky., in 1862. He was kept under arrest in consequence, and resigned his commission the following year.

Crittenden, John Jordan, American legislator; b. Woodford County, Ky., 10 Sept. 1787; d. near Frankfort, Ky., 26 July 1863. He was graduated at William and Mary College in 1807; in 1816 became a member of the State legislature, and in 1817 was elected to the United States Senate. He resigned three years later, but subsequently was re-elected twice. In 1848 he became governor of Kentucky. Through his influence the State remained loyal to the Union in the Civil War.

Crittenden, Thomas Leonidas, American military officer; b. Russellville, Ky., 15 May 1819; d. Annandale, N. Y., 23 Oct. 1893. He was a son of J. J. Crittenden (q.v.), and was educated for the law. In 1842 he became State attorney for Kentucky; served as an officer in the Mexican war, and in 1849 was appointed consul at Liverpool. On the outbreak of the Civil War he became brigadier-general of volunteers, and in 1862 was promoted to major-general. He distinguished himself at Shiloh, Stone River, and Chickamauga. He was placed on the retired list in 1881.

Crittenden, Thomas Theodore, American lawyer; b. Shelby County, Ky., 2 Jan. 1832; d. East Gloucester, Mass., 5 Sept. 1905. He was graduated at Centre College, Danville, Ky., in 1855; served through the Civil War as lieutenant-colonel of the 7th Missouri cavalry; practised law after the close of the War; and filled an unexpired term as attorney-general of Missouri. He was a member of Congress 1877–81; governor of Missouri in 1881–5; United States consul-general at the city of Mexico 1893–7; and afterwards practised law.

Crittenden Compromise, 1860–1: the last desperate effort of the Southern Union party to avert secession and war, by permanently crystallizing the free and slave communities as they stood; dividing the boundaries on the line of the Missouri Compromise, and engaging the Federal power to uphold slavery to the full, where it existed. In the session of Congress after Lincoln's election, the Constitutional Union party (q.v.) having broken down, John J. Crittenden of Kentucky, a leading Unionist senator, introduced a proposition for a constitutional amendment, in substance as follows: (1) Slavery to be abolished in all national territory north of 36° 30′, and recognized and protected south of it, the people to decide the status on its becoming a State; (2) not to be abolished in forts or other Federal territory in slave States; (3) nor in the District of Columbia while it existed in Maryland and Virginia, nor at all without consent of the inhabitants, and compensation, nor slaveholders forbidden to bring their slaves thither; (4) the interstate slave-trade never to be prohibited; (5) the United States to pay for all fugitive slaves rescued by violence, and sue the county of rescue, which could sue the individuals; (6) no future amendment ever to affect these provisions, nor Art. I., § 2, ¶ 3, nor Art. IV., § 2, ¶ 3 of the Constitution; nor to give Congress power to abolish slavery in a slave State. Four resolutions were appended, declaring the Fugitive Slave Act constitutional, urging the repeal of the State personal-liberty laws, promising the modification of two specially obnoxious features of the Fugitive Slave Law, and the rigorous suppression of the outside slave trade. The legislatures of Virginia, Kentucky, Tennessee, and New Jersey instructed their delegates to the Peace Conference (q.v.) of 1861 to support it. In Congress, Crittenden continued to press it during the session. It was lost in the House 14 Jan. 1861, 113 to 80; in the Senate 2 March, 20 to 19.

Croatan, or **Croatoan,** "The Lost Colony." For Raleigh's attempt to colonize Roanoke Island, see ROANOKE COLONY. In 1587 he abandoned the effort, and incorporated a company to settle on Chesapeake Bay, entitled "The Governor and Assistants of the City of Raleigh in Virginia." John White was chosen governor, and sailed with 133 men and 17 women. They were to pick up the 15 men left on Roanoke by Grenville, and go on to the bay, but on arriving 22 July, the captain, a Spaniard, and not impossibly treacherous, refused to take them from the island, where the 15 had all been murdered by Indians. On 16 August was born there the first white American child, Virginia Dare, daughter of the governor's daughter. A few days afterward, White reluctantly yielded to the stranded colonists' petition to return to England for help; but they had agreed to remove 50 miles farther inland, cutting on trees or doorposts at Roanoke the name of the new place when found, and if in distress, carving a cross under it. White had Raleigh fit out a relief expedition for the next spring, but it was impressed by the government for service against the Spanish Armada; White, however, managed to sail 22 April, but was driven back by Spanish ships, and was unable to venture again till March 1591, and then only as a passenger on a West India trader. On 15 August, near his granddaughter's fourth birthday, he arrived, but found the island deserted, his houses pulled down, and a blockhouse with grass growing in it; five buried chests had been dug up and the contents destroyed, the relics, including fragments of his own books, maps, and pictures; and on a large tree from which the bark had been cut was carved: "Croatan" or "Croatoan" in capitals (Strachey says "Cro" only), but no cross. Croatan was an island near by, and White urged the captain to take him there at once. Had it been done the colony would have been rescued, as they were in fact living there peacefully waiting English succor; but a storm came up, and after a few days' beating around the captain insisted on making sail for England. White was broken-hearted and gave up all hope. Raleigh in 1602 sent another expedition to seek them, perhaps still not too late; but the captain was more interested prospecting than

hunting for strays among Indians, and made no effort to find them. Raleigh was never able to send another; and the fate of the colonists was unknown till Indians told the settlers at Jamestown. They had accepted the friendly invitation of the Croatan Indians to live among them, and remained there probably till not long before the Jamestown settlement in 1607, doubtless intermarrying considerably; then the priests or medicine-men had urged "Powhatan" to kill them — probably from jealousy of the influence their superior intelligence gave them — and all had been murdered except four men and two boys saved by one of the chiefs to work his copper-mines, and a "young maid" saved probably for a wife, who may have been Virginia Dare. The latter escaped up the Chowan, and her ultimate fate is unknown; the boys seem to have died or been killed; but the men were taken westward with the small tribe to somewhere around the Neuse or the Cape Fear River in North Carolina. They or their predecessors taught the natives to build two-story stone houses, make roads, use improved agricultural methods, etc. The Huguenots found these Indians there in 1709, and noted their farms and roads, and their gray eyes, different from those of any other Indians; and the protest of a chief of some mixed-blood Indians from Robeson County, N. C., over a murder in 1804, led to an investigation which has instilled a belief that they are the descendants of the Croatan tribe and the colonists. The State has officially recognized them as "Croatan Indians," and their language is said to contain many English words. However this may be, the actual fate of the "lost colony" rests on evidence it is absurd to discredit, and on which in fact we base unquestioned conclusions as to all other early Virginian history. Consult: William Strachey, 'Travaille into Virginia' (Hakluyt Soc., Vol. VI.); Hamilton McMillan, 'Raleigh's Lost Colony' (1888); chart reprinted in Brown's 'Genesis of the United States,' where on the Neuse (apparently) is marked a place at which remained "four men clothed," who had "come from Roanoke."

Croatia, krō-ā'shē-a, a country in the south of Europe, belonging partly to Turkey, but chiefly to Austria-Hungary. Turkish Croatia, forming the northwest extremity of Turkey in Europe, is properly included in Bosnia (q.v.), its leading features being similar. Austrian Croatia forms, with Slavonia, a crownland of Hungary. It is bounded north by Styria and Hungary; east by Hungary; south by Servia, Bosnia, and Dalmatia; and west by the Adriatic, the district of Fiume, Carniola, and Styria; total area, 16,423 square miles. A great part of Croatia is covered with mountains, forming a continuation of the Julian Alps. In the north a small branch of the Carnic Alps forms the watershed between the principal rivers, the Drave and the Save. The vine, olive, mulberry, and fig are cultivated. The south is generally infertile. The principal crops are barley and oats; and, owing to the ruggedness of the surface, the whole country is more pastoral than arable. The inhabitants are Croats, and Raitzes or Serbs, with a small admixture of other races. The chief towns are Agram (the capital), Warasdin, and Karlstadt.

Croatia was anciently inhabited by the Pannonians, who were subdued by the Romans under Augustus. In 489 A.D. it was taken possession of by the Goths, and in 640 A.D. the Croats, a tribe from Bohemia, settled in it, and gave their name to the country. About the end of the 12th century it was incorporated with Hungary, and thenceforth sent representatives to the diet; but retained, and still retains, many of its peculiar political rights and privileges. Pop. (1900), including Slavonia, 2,400,766.

Crochet, krō-shā', a species of knitting performed with a small hook of ivory, steel, or wood, the material used being woolen, cotton, or silk thread.

Crocidolite, krō-sid'ō-līt (Gr. "thread-stone"), a mineral composed of long, delicate fibres, and also occurring massive and earthy, and then called abriachanite. It has the formula $NaFe(SiO_3)_2.FeSiO_3$, part of the iron being frequently replaced by magnesium and calcium, and part of the sodium by hydrogen. The mineral has a hardness of 4 and a specific gravity of about 3.25. The fibrous varieties have a silky luster, and vary from blue to green. Crocidolite occurs in Griqualand West, Africa, in the Vosges Mountains of France and Germany, in Greenland, in Ontario, and in Rhode Island. The South African varieties are often altered by oxidation of the iron, and by infiltration of silica, until they are of a brown or yellow color and exhibit a chatoyant luster. Specimens of this kind are known as "tiger-eye," and, when polished, are used in the manufacture of umbrella handles and other ornamental articles.

Crocin, a coloring matter obtained from the fruit of *Gardenia grandiflora*, Chinese yellow pods, *hoang-tchy*, which is largely used in China for dyeing silk, wool, and other fabrics yellow. The color is extracted from the pods by a complex process, and forms a red powder, which is soluble in water and in spirit. By dilute acids it is decomposed into *crocetin*, which dyes a fine yellow. Crocin has been identified with an analogous body obtained from saffron.

Crocker, Charles, American capitalist: b. Troy, N. Y., 16 Sept. 1822; d. Monterey, Cal., 14 Aug. 1888. He received a common school education and went to California in 1849, where he opened a store. In 1860 he was elected to the State legislature. With Leland Stanford, Mark Hopkins, and Collis P. Huntington, he projected and completed the Union Pacific R.R. system.

Crocker, Francis Bacon, American electrician: b. New York 4 July 1861. He was graduated at Columbia University in 1882; was employed as electrical engineer in 1882–9; became vice-president of the Crocker-Wheeler Electric Company in 1888, and professor of electrical engineering in Columbia University in 1889. He was president of the American Institute of Electrical Engineers in 1897–8, of the New York Electrical Society in 1892–5; and is author of 'Practical Management of Dynamos and Motors'; 'Electric Lighting'; etc.

Crockery. See POTTERY.

Crocket, a Gothic architectural ornament, usually in imitation of curved and bent foliage, but sometimes of animals, placed on the angles or the sides of the pinnacles, canopies, gables, etc. The name is also given to one of the terminal snags on a stag's horn.

Crockett, David, an American pioneer b. Limestone, Greene County, Tenn., 17 Aug. 1786; d. Alamo, Texas, 6 March 1836. He spent a number of years in hunting and pioneer work in western Tennessee, and finally settled in Franklin County in 1811. He served in the Creek war under Jackson; and in 1821 and 1823 was elected to the Tennessee legislature. In 1826 and 1828 he was elected to Congress; was defeated for reelection in 1830 because of his outspoken opposition to Jackson's Indian bill; but was again a successful candidate in 1832. In Washington, although his eccentricities of dress and manner excited comment, he was always popular on account of his shrewd common sense and homely wit; although generally favoring Jackson's policy, he was entirely independent and refused to vote to please any party leader. At the end of his Congressional term, he joined the Texans in their war against Mexico, and in 1836 was one of the force of 140 which defended Alamo, and, as one of the six survivors who surrendered, was shot by order of Santa Anna. He wrote 'A Narrative of the Life of David Crockett' (1834); 'A Tour to the North and Down East,' and 'Exploits and Adventures in Texas.'

Crockett, Samuel Rutherford, Scottish novelist; b. Little Duchrae, Galloway, 24 Sept. 1862. He was educated at Edinburgh and Oxford, and entering the ministry of the Free Church of Scotland in 1886 was for several years pastor of Penicuik. A volume of verse, 'Dulce Cor,' and 'The Stickit Minister,' a volume of prose stories (1893), showed literature to be his vocation. He accordingly left the ministry and has since devoted himself to literature. His later works include: 'The Raiders' (1894); 'The Lilac Sunbonnet' (1894); 'Mad Sir Uchtred' (1894); 'The Playactress' (1894); 'Bog Myrtle and Peat' (1895); 'The Men of the Moss Hags' (1895); 'Sweetheart Travelers' (1896); 'Cleg Kelly' (1896); 'The Grey Man' (1896); 'Lad's Love' (1897); 'Lochinvar' (1897); 'Sir Toady Lion' (1897); 'The Standard Bearer' (1898); 'The Red Axe' (1898); 'The Black Douglas' (1899); 'Ione March' (1899); 'Kit Kennedy' (1899); 'Joan of the Sword Hand'; 'Little Anna Mark' (1900); 'The Stickit Minister's Wooing' (1900); 'Cinderella' (1901); 'Love Idylls' (1901); 'The Firebrand' (1901); 'The Dark o' the Moon' (1902).

Crockett, William Shillinglaw, Scottish clergyman and writer: b. Earlston, Berwickshire, 24 June 1866. He was educated at Edinburgh University and entering the ministry of the Kirk of Scotland has been minister of Tweedsmuir from 1894. He has published: 'Minstrelsy of the Merse'; 'The Poets and Poetry of Berwickshire' (1893); 'A Berwickshire Bard' (1897); 'In Praise of Tweed' (1899); 'Biggar: Historical, Traditional, and Descriptive' (1900); 'The Scott Country' (1902).

Crocodile, a huge reptile of the genus *Crocodilus* and order *Crocodilia*, distinguished from the other genera of the family by having the enlarged fourth lower tooth fitted into an emargination, and not a pit, in the upper jaw, the dorsal head and trunk plates not united and the nasal bones not entering the nasal canal as a septum. The bones of the head have a peculiar corroded and pitted appearance, the skin is marked into transverse rows of hard quadrate areas and in addition protected dorsally by large keeled bony scutes, and the tail is provided with a partly double crest. Although fitted for terrestrial locomotion the feet are as well adapted for aquatic life by being webbed. More remarkable adaptations for life beneath the waters are valves on the snout for closing the nostrils and external ear openings, and especially the arrangement by which the glottis fits into the internal nares, enabling the crocodile to breathe while the mouth is open and to hold a struggling animal beneath the surface until it drowns. A crocodile's stomach is constructed much like a bird's gizzard and is a receptacle for stones and other hard substances by which the food is ground. About 10 living species are known, all of which are strictly aquatic animals; three are American, an equal number African, and the remainder distributed through the Indo-Malayan and North Australian regions.

The only species which enters the United States is *C. americanus*, which is of rare occurrence in southern Florida, where it has been known to exist since 1875, but more common in the West Indies, Central and South America. Little has been written of its habits. It may be readily distinguished from the very much more abundant alligator by the longer, more slender snout with a medium ridge, besides the generic characters mentioned above. The extreme length appears to be about 14 feet. Unlike the alligator it enters brackish and salt water. The African crocodile (*C. vulgaris*) is the longest and best known. It ranges throughout the continent and swarms in the waters of Madagascar and of the upper Nile, but has been exterminated in lower Egypt. Like the alligator, the crocodile is essentially a scavenger, but attacks, drowns, and devours various animals which enter the water in which it lives, not excepting full grown cattle, or even man, especially after nightfall. It is said that, like the tiger, the crocodile acquires a taste for and prefers human flesh, a fact which is well brought out in Kipling's tale of the Indian Mugger. Crocodiles construct dens in the river banks above the water level, which they enter by means of long burrows opening beneath the water; they are used as retreats in case of danger, and in which to devour their prey. Numerous eggs are deposited in a hole or nest in dry earth, the mother remaining near to guard them, a point in which as, indeed, in most of its habits the crocodile resembles our well-known alligator (q.v.). In one of its associates, however, it is unique. A species of leech (*Limnatis nilotica*) infests the great saurian's mouth, which is said to be habitually entered by a plover-like bird for the purpose of feeding upon the parasites. It is not clear to just what species of bird this habit is to be attributed, but most ornithologists consider it to be *Pluvianus ægyptius*. The Egyptian crocodile was anciently the object of elaborate worship, possibly, as was suggested by Eusebius, because it appeared in greatest numbers at the time of the flooding of the Nile; hence it was connected with the fertility of the soil, was cared for by the priests, and in many cases embalmed after death.

Crocodiles, Fossil. Crocodiles are a very ancient group of reptiles, and were much more

abundant and widespread in former geological periods, when the climate was more tropical than it is to-day. They have changed comparatively little in external appearance from the beginning of the Age of Reptiles until now, and the bony plates over the head and back were from the first characteristic of them. The most ancient crocodilian animals were the *Belodontia* (see BELODON) of the Triassic Period, partly intermediate between crocodiles and dinosaurs and with many archaic characters. In the succeeding Jurassic Period flourish primitive marine and fresh-water crocodiles (*Teleosaurus, Bemissartia, Goniopholis*), in which the vertibræ were bi-concave instead of convexo-concave, as in true crocodiles. In the later Cretaceous and Tertiary Periods true crocodiles were abundant, their range extending much farther north than it does now. They are found in the New Jersey greensands, in the Bad Lands of western United States and Canada, and in various parts of northern and central Europe, and their distribution was probably world-wide and not restricted, as now, to tropical or sub-tropical regions.

W. D. MATTHEW.

Crocoite, native chromate of lead, $PbCrO_4$. Crocoite crystallizes in prismatic forms belonging to the monoclinic system, and also occurs in granular and columnar forms. It is scarlet red in color, and translucent, with an adamantine luster. It has a hardness of from 2.5 to 3, and a specific gravity of about 6. It was in this mineral that Vauqelin discovered the element chromium in 1797. Crocoite occurs in the Ural Mountains, also in Brazil and in small quantities in Hungary, the island of Luzon, and in Maricopa County, Arizona. Tasmania is by far the most important locality, having produced many specimens which rank among the finest mineral specimens known.

Crocus, in mythology, a youth who was enamored of the nymph Smilax, and changed into the flower of the name of crocus.

Crocus, a genus of perennial herbs of the natural order *Iridaceæ*. It includes about 70 species characterized by corms, showy, long, funnel-shaped, erect, sometimes fragrant flowers of six nearly equal segments, three stamens, and a subterranean three-celled ovary containing numerous nearly globular seeds. They blossom in autumn or early spring, the spring species being most widely known, and valued for their diversely colored flowers, the ease with which they are cultivated and the cheapness of the corms, commonly called bulbs. The corms are planted about three inches deep in any good garden soil in autumn, and allowed to remain for several years, when, owing to the formation of the new corms above the old ones, the plants are in danger of becoming uncovered. The little corms which have been developed by the old ones are separated, stored in a dry place until autumn, and replanted. They are often planted in lawns, but must there be frequently renewed, because in two or three years the grass chokes them. *C. sativus* yields the formerly well-known dye, saffron, which was prepared from the dried stamens. This coloring-matter has been largely replaced by aniline dyes. About 30 species are cultivated in American gardens and greenhouses. Consult: Bailey, 'Cyclopedia of American Horticulture' (New York 1900–2).

Cro'cus, a polishing powder composed of oxide of iron and prepared by calcining ferrous sulphate. Crocus is purplish in color, and differs from rouge chiefly in its comparative coarseness. (Formerly called "crocus of Mars," or "crocus Martis astringens.")

Croes, John, American Protestant Episcopal bishop: b. Elizabethtown, N. J., 1 July 1762; d. New Brunswick, N. J., 30 July 1830. He served in the American army throughout the Revolutionary War; was ordained in the Protestant Episcopal Church in 1790; and held charges in New Jersey. He conducted a classical school for a number of years; was elected bishop of Connecticut in June 1815, and of New Jersey in August of the same year, and accepting the latter election was consecrated in November following.

Croes, John James Robertson, American civil engineer: b. Richmond, Va., 5 Nov. 1834. He was graduated at the College of St. James, Maryland, in 1854; and was engaged as civil engineer, principally in hydraulic and sanitary work, after 1856. He was engaged in the waterwork construction in New York, Brooklyn, and Washington; became an expert on the problem of water-supply, sewerage, waterworks, and water power valuation, irrigation, and rapid transit in cities; and has written numerous articles on engineering subjects.

Crœsus, king of Lydia. He succeeded his father, Alyattes, 560 B.C. The territory governed by him included nearly all of Asia Minor. His riches, obtained chiefly from mines and the gold dust of the river Pactolus, were greater than those of any king before him, so that his wealth became proverbial. Proud of his treasures, he carried his love of splendor to extravagance, and thought himself the happiest of men. The legend says that, vain of his wealth, he asked the philosoper Solon what he thought of his good fortune: "I pronounce no man fortunate until his death," was the sage's reply. Subsequently Crœsus was made prisoner by Cyrus, king of Persia. When seated on the funeral pyre and about to be burned to death, he recalled the words of Solon, and thrice repeated his name. Cyrus demanded an explanation. Crœsus gave it, and Cyrus not only spared his life, but also took him into his favor and protection. At the death of Cyrus he recommended Crœsus to the favor of Cambyses.

Crof'fut, William Augustus, American prose writer and poet: b. Redding, Conn., 29 Jan. 1835. He has been connected with various leading newspapers, and has published: 'A Helping Hand' (1861); 'A Midsummer Lark' (1882); 'Bourbon Ballads' (1880); 'The Folks Next Door' (1892); 'The Vanderbilts' (1886); 'The Prophecy and Other Poems' (1893); etc. He has long been connected with the United States Geological Survey.

Crof'ters, a term applied in Scotland to a species of small farmers, the occupiers of small pieces of land, from which they derive their livelihood, or great part of it, by cultivation or rearing and grazing cattle. Crofters are numerous in the Highlands and Western Islands of Scotland, and they live for the most part in townships, each with his own piece of arable land, but with a joint tenancy in mountain pas-

ture. From some districts, in recent times, they have been summarily removed to make room for sheep farms and deer forests, so that they are now chiefly congregated on the seashore, where they are able to maintain themselves in part by fishing, and generally eke out a precarious existence. They have often complained of many grievances, such as high rents, want of compensation for disturbance, small holdings, excessive local rates, and want of harbors and railways. Under the Crofters Act (1886) some of these hardships have been removed, and great reductions of rent granted. This act is applicable only to the counties of Argyle, Sutherland, Inverness, Caithness, Ross and Cromarty, and Orkney and Shetland, where there are estimated to be 40,000 families of the crofter class. There are crofters to some extent also in other counties, but generally these seem to be in more favorable circumstances.

Croghan, George, American military officer: b. near Louisville, Ky., 15 Nov. 1791; d. New Orleans 8 Jan. 1849. He was graduated at William and Mary College in 1810, and greatly distinguished himself at the defense of Fort Meigs and Fort Stephenson in 1813, receiving a gold medal from Congress.

Croker, B. M. (Sheppard), English novelist. She married Lieut.-Col. John Croker of the Royal Munster Fusiliers, and spent 14 years in India and Burma. Her writings include 'Proper Pride' (1882); 'Pretty Miss Neville' (1883); 'Some One Else' (1884); 'A Bird of Passage' (1886); 'Diana Barrington' (1888); 'Two Masters' (1890); 'Interference' (1891); 'A Family Likeness' (1892); 'Mr. Jervis' (1894); 'Village Tales and Jungle Tragedies' (1894); 'Married or Single' (1895); 'The Real Lady Hilda' (1895); 'In the Kingdom of Kerry' (1899); 'Beyond the Pale' (1897); 'Miss Balmaine's Past' (1898); 'Terence' (1899); 'A State Secret' (1901); and 'Angel' (1901).

Croker, John Wilson, Irish miscellaneous writer: b. Galway 20 Dec. 1780; d. Hampton 10 Aug. 1857. His capacity for satire revealed itself in 'An Intercepted Letter from Canton,' and his 'Songs of Trafalgar' spread his fame as a poet. Macaulay's review of his edition of Boswell's 'Life of Johnson,' and his counter-blast upon Macaulay's 'History of England,' are among the celebrities of literary duels. He was a Tory politician of intense fervor, permanently resigning his seat in Parliament because of the passage of the Reform Bill of 1832.

Croker, Richard, American politician: b. Black Rock, Ireland, 24 Nov. 1843. He came to the United States in early life, was alderman of New York three times, and in 1889–90 was city chamberlain. He became prominent in politics during the scandal of the Tweed ring, whose schemes he vigorously opposed; was for several years at the head of Tammany Hall; and was long the Democratic dictator of New York State and city. In 1902 he took up permanent residence at Wantage, England.

Croll, krōl, **James,** Scottish geologist: b. Little Whitefield, Perthshire, 1821; d. Perth 15 Dec. 1890. In 1859 he was appointed keeper of the museum in the institution known as Anderson's University, Glasgow, a position which he occupied till his appointment to a minor post in the Geological Survey of Scotland in 1867. His writings include 'The Philosophy of Theism' (1857); 'Climate and Time in their Geological Relations' (1875), perhaps his ablest work; 'Discussions on Climate and Cosmology' (1880); 'Stellar Evolution' (1889); 'The Philosophical Basis of Evolution' (1890).

Crollius, Oswald, German chemist: b. Wetter, Oberhessen, about 1580; d. 1609. He is now remembered as the author of a work entitled, 'Basilica Chymica,' which appeared at Frankfort in 1609, and went through 18 editions, was translated into French, into German, and by Richard Russell into English, under the title of 'Royal and Practical Chymistry' (London 1670). This is a remarkable mixture of speculative ideas about the action of chemical substances in different diseases, and practical skill in the preparation of the substances themselves. Crollius was obviously quite familiar with the details of the processes he describes, although they sometimes would, sometimes would not yield the bodies he intended, and although he was of course ignorant of the true composition of many of them. By his manipulative skill he discovered new preparations, which he introduced into medicine, and which still remain, and this practical ability seems to have given weight to his therapeutic theories.

Croly, krō'lī, **David Goodman,** American journalist: b. New York 3 Nov. 1829; d. New York 29 April 1889. He was educated at the University of New York; was reporter on New York papers in 1855–8; city and managing editor of the New York *World* in 1860–72, and editor of the New York *Daily Graphic* until 1878. He foretold the financial panic of 1873, naming the firm of Jay Cooke & Company as the first to fail. His publications include a 'History of Reconstruction' (1868); 'Primer of Positivism' (1876); etc.

Croly, George, Irish author and clergyman: b. Dublin August 1780; d. London 24 Nov. 1860. He was educated at Trinity College, in his native city, took orders in 1804, and in 1810 went to London, where in 1834 he became rector of St. Stephen's, Walbrook. Between 1817 and 1858 Croly published some 40 works — the best known being the romance of 'Salathiel,' reprinted in New York in 1901 under the title 'Tarry Thou Till I Come' and obtaining a new lease of popularity. He was a poet of some note, two volumes of his verse appearing in 1830.

Croly, Jane Cunningham ("Jennie June"), American writer: b. Market Harborough, England, 19 Dec. 1831; d. New York 23 Dec. 1901. She removed to New York in 1841, and in 1856 married D. G. Croly (q.v.). She was editor of 'Demorest's Magazine' 1860–87, and of other periodicals. She was one of the founders of "Sorosis" and its president for 14 years, and one of the most active promoters of the Federation of Women's Clubs. She published: 'Talks on Women's Topics' (1863); 'For Better or Worse' (1875); 'Three Manuals for Work' (1885–9); 'History of the Woman's Club Movement in America' (1900), etc.

Cromarty, Scotland, a small county in the north, formerly consisting of 14 detached portions scattered over the county of Ross, with

which county it is now entirely incorporated. The total area was about 220,800 acres. This singularly awkward county was formed at the request of an Earl of Cromarty, who desired that one county might contain all his lands wherever situated.

Cromarty Firth, a long, narrow inlet of the sea running into the united county of Ross and Cromarty in a southwesterly direction, and having a length of about 18 miles, and an average breadth of two to five miles. Its entrance from the Moray Firth, between two bluff-wooded headlands called the Sutors of Cromarty, is about a mile wide, with 30 to 40 fathoms water. Being completely landlocked it affords excellent shelter for shipping, and is often crowded in stormy weather. At its upper end it receives the river Conan, and this portion of the firth is shallow, several square miles of mud-flats being laid bare at low-water. On its shores are the towns of Cromarty, Invergordon, and Dingwall.

Cromcruach, or **Cromchruach,** the name of an idol worshipped by the people of Ireland before the introduction of Christianity. It was a gold or silver image surrounded by 12 small images.

Crome, John, English landscape painter: b. Norwich 22 Dec. 1768; d. there 22 April 1821. His school education was very scanty, but after some struggle he succeeded in getting established as a drawing-master. In 1803 he founded the Norwich Society of Artists, of which he became president as well as chief contributor to its annual exhibitions. Some of his pictures are: 'Mousehold Heath'; 'View of Chapel Fields, Norwich'; 'Carrow Abbey'; and 'Clump of Trees.' He excelled in depicting the scenery of his native county, and especially in his handling of trees; and his high place among British landscape painters is now universally acknowledged. He also practised etching with great success. He is sometimes called "Old Crome," to distinguish him from his son, Bernay Crome, also an artist.

Cromer, Viscount. See BARING, SIR EVELYN.

Cromlech, krŏm'lĕk, the name given to a kind of ancient sepulchral monument, numbers of which have been found in all parts of the British Islands, as well as on the continent of Europe, in Asia, and in America. A cromlech consists of three or more columns of unhewn stone supporting a large tabular block so as to form with it a rectangular chamber, beneath the floor of which is generally found a sepulchral chamber or cist enclosing a skeleton, with arms, stone implements, and other ancient relics. Sometimes the cromlech was encircled by a ring of standing stones, as is seen in the case of the Standing-stones of Stennis, in Orkney; and sometimes it was itself buried beneath a large mound of earth. Among the most remarkable cromlechs in England are those known as Kit's Coty House, near Aylesford, in Kent, consisting of three upright stones with a very large flat one above them; the cromlech of Chun Quoit, in Cornwall, the capstone of which is calculated to weigh 20 tons; and two cromlechs standing beside each other at Plas Newydd in Anglesey. Among cromlechs in Scotland we may mention one near Craigmaddie House, Stirlingshire, known as the Auld Wives' Lifts, remarkable for being a complete cromlech consisting of three stones only; and a partially ruined one at Bonnington Mains, near Edinburgh, called the Witch's Stone, the capstone of which measures 11½ feet long, and 10½ feet in greatest breadth. The term cromlech is supposed by Prof. Daniel Wilson to be derived from *cromadh* (Gaelic) or *cromen* (Welsh), signifying a roof or vault, and *clach* or *lech*, a stone, and would therefore mean the suspended or vaulted stone. See DOLMEN.

Crommelin, krŏm-mĕ-lăn, **May de la Cherois,** shā-rwä, Irish novelist: b. in Ireland, the descendant of a Huguenot founder of the Ulster linen trade. She has traveled very extensively, and is the author of: 'Queenie'; 'My Love, She's But a Lassie'; 'A Jewel of a Girl'; 'Black Abbey'; 'Miss Daisy Dimity'; 'Orange Lily'; 'Joy'; 'In the West Country'; 'Brown Eyes'; 'Goblin Gold'; 'Violet Vivian, M. F. H.'; 'For the Sake of the Family'; 'Love Knots'; 'Dead Men's Dollars'; 'Bay Ronald'; 'Dust Before the Wind'; 'Over the Andes,' a volume of travel; 'Half Round the World for a Husband'; 'Divil-May-Care'; 'Kinsah, a daughter of Tangier'; 'Bettina'; 'The Luck of a Lowland Laddie'; 'A Woman Derelict.' Her novels have circulated extensively in the United States.

Crompton, Samuel, English inventor: b. Firwood, near Bolton, 3 Dec. 1753; d. Bolton 26 June 1827. He early displayed a turn for mechanics, and when only 21 years of age invented the machine for spinning cotton which is now constantly associated with his name, and was called a mule, from its combining the principles of Hargreave's spinning jenny and Arkwright's roller-frame, both of which had been invented a few years previously. The mule shared in the odium excited among the Lancashire hand weavers against these machines, and for a time Crompton was obliged to take his invention to pieces and conceal it from view. He afterward refitted it and brought it again into work; but was unfortunately unable to prevent others from appropriating the fruits of his labors, and thus, as in many similar cases, the real inventor derived little or no benefit. Various improvements were introduced from time to time on the mule, but the original principle, as devised by Crompton, remained the same. In 1812 the sum of £5,000 was voted to him by Parliament. This was almost all the remuneration which he ever received for an invention which contributed so essentially to the development of the greatness of Great Britain as a manufacturing nation. See French, 'Life and Times of Crompton' (1860).

Cromwell, Bartlett Jefferson, American naval officer: b. Georgia, 2 Feb. 1840. He was at the Naval Academy 1857–60, and is said to have been the first naval cadet appointed from Nebraska. He served on the St. Lawrence, Quaker City, and Conemaugh with the South Atlantic blockading squadron 1861–3; and with the East Gulf squadron 1863–5. He was commissioned commander 24 Oct. 1874; was inspector of ordnance 1878; on duty at Portsmouth navy yard 1882–5; League Island navy yard 1886–9; and promoted captain in March 1889. At the conclusion of the Spanish-American war he was ordered to Havana to receive the surrender of the naval station there. He became

a rear admiral 3 March 1899. Up to January 1901 he had had 10 years of sea service, and 24 of shore or other duty.

Cromwell, Henry, English soldier: b. Huntingdon, Eng., 20 Jan. 1628; d. Soham, Cambridgeshire, 23 March 1674. He was the fourth son of Oliver Cromwell, under whom he served as colonel in Ireland in 1649. He sat in Parliament in 1653 and was lord deputy of Ireland 1655–7, and lord-lieutenant 1657–9, his rule being conservative and popular. After 1659 he lived in retirement in England.

Cromwell, Oliver, lord-protector of England: b. Huntingdon 25 April 1599; d. London 3 Sept. 1658. His father was Robert Cromwell, a younger son of Sir Henry Cromwell, knighted by Queen Elizabeth; and Sir Henry again was a son of Sir Richard Williams, a nephew of Thomas Cromwell, Earl of Essex, whose name he took. Oliver's mother could trace her descent back to Alexander, lord-steward of Scotland, the founder of the house of Stuart. He entered Sidney-Sussex College, Cambridge, 23 April 1616, but left on the death of his father in 1617. In 1620, at the age of 21, he married Elizabeth, daughter of Sir James Bourchier, and settled on his estate at Huntingdon. In 1628 he was a member of Parliament for Huntingdon, and distinguished himself by his zeal against popery. On the dissolution, in 1629, he returned to Huntingdon; in 1631 he went with his family to a grazing-farm he had taken at St. Ives; and four years after, to Ely, where he had inherited a property. While in this place he successfully opposed some unjust schemes for the draining of the fens, and thereby made himself so popular with the people of the place that they gave him the title of "lord of the fens."

The storm was already at hand which was to shake the repose of England. Several of the opponents of the arbitrary measures of the government were making arrangements to embark with their families for New England. Among those already engaged in this scheme were Cromwell, Hampden, Pym, Hazelrig, and other men afterward so formidable in the Revolution; but the government forbade their emigration. At length the king was compelled, by the state of affairs in Scotland, to summon a Parliament. Cromwell, now a member for Cambridge and others were so loud in their complaints of abuses in Church and state that Charles prorogued the Parliament, but six months after, was obliged to reassemble it. In this Parliament, called the Long Parliament (from Nov. 1640 to April 1653), Cromwell attracted notice chiefly by his rustic and slovenly dress, and by the vehemence of his oratory.

On the breaking out of the war in 1642, being appointed captain, and afterward colonel, he raised a troop of horse (the "Ironsides") composed of zealous Puritans. His first military exploit was to capture the magazine of Cambridge along with the university plate. He then routed the Royalists, and made himself master of their supplies. He laid the foundation of his military fame by the relief of Gainsborough, and in October 1643, he was assailed by a greatly superior Royalist force at Winceby, but defeated it. In this action he had a horse killed under him, and was himself struck down while in the act of rising. On 3 July 1644 the battle of Marston Moor was gained by the parliamentary army, a result mainly brought about by Cromwell and his Ironsides. Cromwell also bore a distinguished part in the second battle of Newbury (27 Oct. 1644) under the Earl of Manchester. The independent party, led by Cromwell and his friends, were for pursuing the war with the utmost vigor, and in order that they might have their way determined to get the entire control of the army. In order to accomplish this, they procured the passing of the Self-denying Ordinance, prohibiting members of either house of Parliament from holding any military command, on the ground that vices and corruptions had crept into the army, that it required to be remodeled and a stricter discipline maintained. Thomas Fairfax was made lord-general in place of Essex, while Cromwell was again placed under him, with the rank of lieutenant-general. Cromwell now introduced into the whole army the excellent discipline in which he had already trained a part of it, and gained the decisive battle of Naseby (14 June 1645), in which the king was routed with great loss. The spirit in the army, which the officers, and especially Cromwell, excited by their sermons and prayers, had now risen to fanaticism; though at the same time good order and morality were so well maintained that profanity, drunkenness, robbery, and the like offenses, hardly ever occurred. After Naseby no time was lost by the parliamentary leaders in following up their success. Leicester was retaken, Taunton relieved, Bridgewater stormed, Bristol, held by Prince Rupert, was besieged and surrendered, Devizes was stormed, Winchester surrendered, Dartmouth was stormed, and finally Sir Jacob Astley, at the head of 3,000 horse, was defeated at Stow-on-the-Wold, 21 March 1646.

The Royal party was completely crushed, and Charles took refuge with the Scottish army (5 May 1646), but was soon given up by them to the Parliament, on which occasion Cromwell was one of the commissioners. When Parliament, in which the Presbyterian element predominated, wished to disband the army, headed by the Independents, the soldiers appointed a council of officers and a body of subalterns and privates called Adjutators (misspelt agitators), who declared to the Parliament that they would not lay down their arms till the freedom of the nation was established. Some of the soldiers conducted themselves so boldly that the Parliament ordered their arrest; on which occasion Cromwell not only supported the house, but deplored the seditious temper of the troops, which, he said, had even put his own life in danger. Cromwell seems at this time to have contemplated the restoration of the king, and, supported by Fairfax and others, even entered into a treaty with him, but soon discovered that Charles was not to be trusted, and that the king's success would be his destruction. Fighting now took place with the Royalist party in Wales, but Cromwell soon finished the struggle in this quarter; after which he proceeded against the Scotch, who had raised a strong army "to deliver the king from sectaries." As Fairfax, from Presbyterian scruples, declined the command of the expedition against Scotland, Cromwell undertook it. With a much inferior force he defeated them at Preston (17 Aug.

1648), and was received in Edinburgh as a deliverer. Now followed the tragedy of the king's execution, 29 Jan. 1649. Cromwell's name stood third in order in the death-warrant, and though he may have been impelled to the step by the force of circumstances and by his knowledge of the king's faithlessness, there is no reason to suppose that he regretted the share he took in the death of the king, or thought that he was unjustly punished. Affairs in Ireland now demanded his presence, and having been appointed lord-lieutenant and commander-in-chief, he joined the troops there in August 1649. He took Drogheda by storm (September 1649), where he gave orders that nothing should be spared. Most of the cities opened their gates without resistance, and within six months the Royalist party in Ireland was wholly crushed.

Resigning the command to Ireton, he now undertook, at the request of the Parliament, a similar expedition against Scotland, where Prince Charles, afterward Charles II., had been proclaimed king. The victory at Dunbar, 3 Sept. 1650, rid the fortunate general of his enemies, the Presbyterians. Meanwhile Prince Charles had collected new forces; but Cromwell, by skilful marches near Stirling, cut him off from his points of support, when, contrary to his expectation, the prince entered England, and threatened the metropolis itself. Cromwell hastened after the Scottish troops into England. Charles was totally defeated at Worcester 3 Sept. 1651, and this victory, which Cromwell called the crowning mercy of God, gave the commonwealth party full power over three kingdoms. Cromwell already exerted a weighty influence on the supreme direction of public affairs. He succeeded in restoring the continental relations of England, which had been almost entirely dissolved, and regulated them so as to promote the interests of commerce. The Navigation Act, from which may be dated the rise of the naval power of England, was framed upon his suggestion, and passed in 1651. Meantime the Long Parliament, aiming to establish its own power, was growing more and more unpopular, in consequence of its undisguised tyranny, the war which it had provoked with the Dutch, and its treatment of the prisoners taken at Worcester, some of whom were put to death in prison, and others sold for slaves in the colonies. Cromwell now spoke openly to his friends of the ambition, the godlessness, and injustice of the Parliament. Encouraged by their support he, with 300 soldiers, dispersed that body 20 April 1653. He then summoned a council of state consisting mainly of his principal officers, which finally chose a parliament of persons selected from the three kingdoms, which, from Praise-God Barebone or Barbone, one of the principal characters in it, by trade a leather seller, was nicknamed Praise-God Barebone's Parliament, another name being the Little Parliament. Cromwell opened the session with a speech, in which he said that the day was come on which the saints were to commence their reign upon earth. Fifteen months after, a new annual parliament was chosen; but after five months Cromwell prevailed on this body to place the charge of the commonwealth in his hands. The chief power now devolving again upon the council of officers (12 Dec. 1653), they declared Oliver Cromwell sole governor of the commonwealth, under the name lord-protector. The new protector behaved with dignity and firmness. With the aid of Gen. Lambert he formed a constitution called the Instrument of Government, by which the protector with his council was invested with the power of peace and war, and was to summon a parliament once every three years, the supreme legislative authority was declared to be and to reside in the lord-protector and Parliament; all commissions, patents, writs, processes, etc., were to run in the name of the lord-protector; all the forces of the kingdom were to be under the protector and Parliament during the sitting of the latter, but in the intervals of Parliament, under him and his council alone. In case of his death the council were immediately to choose a new protector; but no protector after him was to command the army. The nobles feared, the clergy hated the protector; while the people, whom he treated with equity and kindness, loved him, because they enjoyed much more liberty under him than before. The protector treated Ireland with great severity. Here, however, as in Scotland, he established an equitable form of government, which, in the course of a few generations, would have much improved the state of the island. On the whole his political administration was masterly, and adapted to the circumstances of his situation. He established large magazines of provisions; the pay of the soldiers was regularly delivered to them a month in advance; yet the public revenues were strictly and economically managed, without any additional imposts. He appointed for judges the most upright and distinguished men. He never interfered with the proceedings of the courts of justice. In religion he acted on the principle of toleration. Every man had liberty of conscience. In other things, too, Cromwell, as his own correct judgment prompted, would have governed with mildness and justice, and promoted the arts and sciences, but was obliged to maintain his power, as he had acquired it, by a severity often amounting to tyranny. The skilful and fortunate conduct of the war with Spain, from 1655 to 1658, in which Jamaica and Dunkirk were taken, made the new Parliament, from which Cromwell had carefully excluded all Republicans, so obsequious, that they at last offered him the title of king. Some individuals opposed the measure so resolutely that Cromwell, fearing the fate of Cæsar, declined the title. Parliament by an act entitled Humble Petition and Advice, gave him the title of "Highness," and the right of appointing his successor; and he was a second time solemnly invested by the speaker with the ensigns of his office. He died at Whitehall, whither he had been brought from his favorite residence, Hampton Court, and was buried in King Henry VII.'s Chapel, in Westminster Abbey. Most of the European courts went into mourning for him, even that of Versailles. After the Restoration his body was taken up and hanged at Tyburn, the head being fixed on a pole at Westminster Abbey, and the rest of the remains buried under the gallows. Great as a general, Cromwell was still greater as a civil ruler. He was abstemious, temperate, indefatigably industrious, and exact in his official duties. His exterior inspired neither love nor confidence; his figure had neither dignity nor grace: his voice was harsh; in his public speeches he

expressed himself with force and fire, but without method or taste. On the other hand, he possessed extraordinary penetration and knowledge of human nature; no one knew so well as he the art of winning men and using them to his purposes. He devised the boldest plans with a quickness equaled only by the decision and intrepidity with which he executed them. No obstacle deterred him; and he was never at a loss for expedients. Cool and reserved, but full of great projects, he patiently waited for the favorable moment, and failed not to make use of it. In his religious views he was an upright and tolerant Calvinist.

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Cromwell, Oliver, English solicitor; b. 1742; d. Cheshunt, Hertfordshire, 31 May 1821. He was the great-grandson of Henry Cromwell, son of the protector, and the last of his known descendants. He succeeded to the estate of Theobalds, which descended to him through the children of Richard Cromwell, eldest son of the protector. He wrote the 'Memoirs of the Protector, Oliver Cromwell, and his Sons, Richard and Henry, illustrated by Original Letters and other Family Papers' (1820).

Cromwell, Richard, lord-protector of England: b. Huntingdon 4 Oct. 1626; d. Cheshunt, Hertfordshire, 12 July 1712. He was the third son of Oliver Cromwell, and by the deaths of his two elder brothers, Robert and Oliver, became his father's heir. He was an amiable and popular but weak man, devoted to field sports and fond of pleasure. He lived for some time in comparative privacy, succeeding his father in the protectorate in September 1658. Scarcely had he entered on his office, when the forces of anarchy, both parliamentary and military, broke loose, and he found himself utterly unable to restrain them. It was probably with little reluctance that he quitted Whitehall in April 1659, and retired into private life. After the Restoration he lived for a time abroad under the name of Clark, but he returned to England about 1680, and passed the remainder of his life at Cheshunt, and was buried in the church at Hursley, Hampshire.

Cromwell, Thomas, Earl of Essex, English statesman: b. Putney, Surrey, about 1485; d. London 28 July 1540. In 1514 Wolsey made him collector of the revenues of his see of York, and nine years later he entered Parliament, where his ability soon attracted attention. In 1524 he became a member of Gray's Inn, and Wolsey now employed him in the work of suppressing the smaller monasteries. On his master's disgrace in 1529 Cromwell defended him with great spirit in the House of Commons, and effectually opposed the articles of treason brought against Wolsey. After the cardinal's death he was taken into the king's service, into which he entered with zeal, but with little consideration or regard for others. He was knighted and made a privy councilor; in 1533 was appointed chancellor of the exchequer, and in 1534 king's secretary and master of the rolls. On the abolition of the Pope's supremacy in 1534 he was created king's vicar-general, and used all his influence to promote the reformation. In 1535 he was commissioned to hold a general visitation of all the monasteries in England, in order to suppress them. In this office he acted with great severity and injustice. His services were rewarded by the situation of lord-keeper of the privy seal, and a seat in the House of Peers, with the title of Baron Cromwell of Oakham. In 1539 he became lord high chamberlain, and the following year Earl of Essex. He at length fell into disgrace with the king for the part he took in promoting his marriage with Anne of Cleves. Her person proved disagreeable to Henry, who fell in love with Catharine Howard, and partly in consequence Cromwell was arrested at the council table on a charge of treason, committed to the Tower, and a bill of attainder was passed against him. After appeals for mercy, which were disregarded by the king, he was beheaded on Tower Hill, declaring that he died in the faith of the Catholic Church. Protestantism owed much to Cromwell, as did also the English Bible (an edition of which was known by his name), yet he seems to have been never influenced by religious or moral principle, but by desire to retain the king's favor as a means of his own aggrandizement. Consult Drayton, 'Historie of the Life and Death of Lord Cromwell' (1609); Merriman, 'Life and Letters of Thomas Cromwell' (1902).

Cronje, krōn'yĕ, **Pietrus Arnoldus,** Boer military commander: b. near Pretoria 1835. He has been prominent in all the history of the South African republic. Bred to farm life, he entered politics, refused office under British annexation in 1877, commanded a brigade in the war of 1880–81, because a member of the Transvaal executive government, and captured Sir John Willoughby and his force after the Jameson raid in 1896. During the war with England in 1899–1900, Cronje rose to the military leadership of the Boers, and held out heroically with an inferior force till forced to surrender to Lord Roberts at Klip River, near Paardeberg, Orange Free State, 27 Feb. 1900, the anniversary of the battle of Majuba Hill in 1881. He was exiled to Saint Helena in May 1900.

Cronstadt. See KRONSTADT.

Cronstedt, krōn'stĕt, **Axel Frederic,** Swedish scientist: b. Stropsta Nykoping, Sweden, 23 Dec. 1702 (others say 1722); d. Stockholm 19 Aug. 1765. He was a baron, councilor of mines, and member of the Academy of Sciences at Stockholm. In 1758 he published anonymously an important work on mineralogy. He first distinguished between minerals and rocks, and made chemical composition the basis of classification in minerals, and was the first to isolate nickel. The mineral *Cronstedtite*, a silicate of iron and manganese, forming highly lustrous jet-black crystals, and found in Cornwall and elsewhere, has been named in honor of him.

Cronus, in ancient Greek mythology, a son of Uranus and Ge (Heaven and Earth), and youngest of the Titans. He received the government of the world after Uranus was de-

prived of it, and was in turn deposed by Zeus. Cronus was considered by the Romans as identical with their Saturnus. See SATURN.

Crook, George, American military officer: b. near Dayton, Ohio, 8 Sept. 1828; d. Chicago, Ill., 1 March 1890. He was graduated at the United States Military Academy in 1852, and rose to the rank of major-general. In the Civil War he greatly distinguished himself at South Mountain, Antietam, Chickamauga, and Appomattox, and after the War achieved celebrity in campaigns against the Indians as commander of the districts of Idaho and Arizona. From 1888 until his death, he commanded the military division of the Missouri.

Crooked Island, one of the Bahamas, in lat. 22° 15′ N., lon. 74° W. Area about 160 square miles. The chief product is salt.

Crooked Lake. See KEUKA LAKE.

Crooker, Joseph Henry, American Unitarian clergyman: b. Foxcroft, Maine, 8 Dec. 1850. He was graduated at Ypsilanti (Mich.) Union Seminary in 1870, and was a Baptist pastor for five years, when he entered the Unitarian ministry. He has been very successful as a pastor at Madison, Wis., 1881–91; Helena, Mont., 1891–7; and Ann Arbor, Mich., 1897. Among his publications are: 'Jesus Brought Back' (1889); 'Different New Testament Views of Jesus' (1890); 'The New Bible and Its New Uses' (1893); 'Growth of Christianity' (1897); 'Plea for Sincerity' (1898); 'Problems in American Society' (1899); 'The Supremacy of Kindness' (1899); 'The Menace to America' (1900).

Crookes, SIR William, English electrician and chemist: b. London 1832. In 1854 he became superintendent of the Meteorological Section of the Radcliffe Observatory, Oxford, and in the following year was chosen professor of chemistry at the Chester Training College. In 1863 the Royal Society elected him a Fellow, and since then many scientific bodies have conferred distinctions on him. He was knighted in 1897, and presided over the 1898 meeting of the British Association at Bristol. Prof. Crookes has made his name famous by his important researches and inventions in connection with molecular physics, radiant matter, and high vacua. One of his earliest works was 'Select Methods of Chemical Analysis' (1871). His later ones consist mainly of practical manuals, or of translations and adaptations. Among the former are 'Manufacture of Beetroot Sugar in England' (1870); 'Handbook of Dyeing and Calico-printing' (1874); and 'Dyeing and Tissue-printing' (1882). The latter include Kerl's 'Metallurgy'; Wagner's 'Chemical Technology'; Auerbach's 'Anthracen and Its Derivatives'; and Ville's 'Artificial Manures.' He is an authority on sanitation, and in this connection has written pamphlets entitled 'A Solution of the Sewage Question,' and 'The Profitable Disposal of Sewage.' In 1874 he published his 'Researches in Modern Spiritualism,' and in the following year 'Psychic Force and Modern Spiritualism,' the latter being a reply to those critics who had attacked the defense of spiritualistic beliefs contained in the earlier work.

Crookes' Tubes, sealed glass tubes or vessels, of various shapes, highly exhausted by means of efficient mercurial air-pumps, so that the residual gas that they contain is exceedingly attenuated. Such tubes manifest singular properties when the gas within them is submitted to the action of the electric discharge, by means of electrodes sealed into the glass. (See GASES, KINETIC THEORY OF; MOLECULAR THEORY; RADIATION; VACUUM.) The name refers to Sir William Crookes, the noted English physicist and chemist, who discovered many of the phenomena that high vacua exhibit.

Crookston, Minn., city and county-seat of Polk County, on Red Lake River, and on the Great Northern and Northern Pacific railroads, 300 miles northwest of Saint Paul. Crookston was first settled in 1877 by Col Crooks, became a borough in 1880, and a city in 1882. It is a commercial centre of a fertile agricultural region, and carries on a large business in lumber, wheat, and live stock. It has four banks, with a combined capital of $225,000, and an annual business of $10,000,000. The city has a fine court-house and municipal buildings, two Roman Catholic and 12 Protestant churches, a fine High School, two large business colleges, a gymnasium, and a public library. The city government is administered under a charter which provides for a mayor and a council of 11 members, elected annually. Pop. (1903) 7,000.

Crop'sey, Jasper Francis, American artist: b. Westfield, Richmond County, N. Y., 18 Feb. 1823; d. Hastings, N. Y., 22 June 1900. Having received a few lessons in water colors, he devoted himself to landscape painting, and his third picture, a view of Greenwood Lake in New Jersey, procured his election as an associate of the American Academy of Design, of which in 1850 he became a full member. In 1847 ill health compelled him to visit Europe, where he spent three years in close study of his art. Among his most successful productions after his return to America were the 'Sibyl's Temple'; 'American Harvesting'; 'Peace'; 'War'; and 'Niagara Falls.'

Croquet, to the most scientific form of which the name ROQUE is given in America, an open-air game played with balls, mallets, and arches, either upon a closely mowed lawn or a specially prepared court. The game is substantially a revival of the old game of pall mall, which gave its name to the well-known London street. France introduced this game into Ireland and thence into England early in the 17th century, and during the 18th century it was largely neglected, but came again into favor about 1850 and was later superseded in popularity by tennis. When first introduced into the United States croquet was a simple game destitute of all opportunity for skill, but it has so developed that it is now considered by experts to be as scientific as billiards. The court upon which the most improved form of this game is now played has a hard rolled and lightly sanded surface composed of either loam or clay, the nature of this material being determined by the character of the native soil upon which the ground is built. The regulation size for the court is 36 feet by 72 feet, the angles of the rectangle being cut off by 8 foot corner pieces. This space is enclosed by heavy timbers 4 x 6 inches, which are securely spiked together about the ground and which not only serve to confine the balls to the court, but are invaluable in driv-

ing balls to some desired position in another part of the ground, and are of even more value in making carom shots as on a billiard table. A player frequently finds his ball in such a position upon commencing his turn of play that he has not a straight shot for either a ball or his arch, and at such times a carom shot is resorted to to strike or capture one of the wired balls. In order to facilitate carom or bank shots and to ensure as great accuracy as possible, use is made of rubber cushions similar to those used upon billiard tables, fitted to the inside of the border timbers, so that surprising accuracy in making caroms is attained. The balls used upon these courts are made of the finest quality of vulcanized rubber and are somewhat expensive. These are very carefully made and must conform to a regulation size of 3¼ inches. The wickets, 10 in number, are made of ⅜ or 7-16 inch finest steel rod and are arched at the top, so as to leave, when bent, a distance between wires of 3½ inches in all of the arches except the centre or "eage," as it is called, where only 3⅜ inches is left. It can readily be seen that a ball having a diameter of 3¼ inches must be almost directly in front of, and in close proximity to, a wicket of 3½ or 3⅜ inches in width in order to successfully pass through. To ensure rigidity and to prevent spreading, the wickets after they are bent are driven into heavy wooden blocks 4 x 8 x 18 inches, across the top of which steel plates, properly drilled to fit the arches, have been bolted. The blocks are then buried under the ground, so that the arch stands between 8 and 9 inches above the surface. The stakes, which are located at the starting and turning points in the game, are 1½ inches high and 1 inch in diameter. The mallets, which range in price from $5 to $20, are very carefully made, usually to order. Their dimensions and weights vary according to individual taste, but the average sizes are: Length of handle, 10 inches; length of head, 7½ inches; diameter of head, 2 or 2¼ inches. The average weight is about two pounds. The ends or faces of the mallet heads are protected by heavy steel or brass ferules, and the faces themselves are made of either ivory or vulcanized rubber, in the one end, and soft rubber in the other, the latter being used for making certain shots which are impossible with the hard end.

While the old game croquet was, and, in fact, is still played by any number of persons up to eight, roque as played to-day contemplates the participation of but two players in a game, each of whom uses two balls, playing them as partners against the opposing two of the adversary. The object of the game is to play by stroke of the mallet through all of the arches, with both balls in order, by any number of turns or plays, and finally putting both partner balls out by making them strike successively the home stake. The player who succeeds in doing this first is the winner. While advancement of one's own balls is of course of primary importance, hardly less important is the ability to retard the progress of one's opponent. This is often done by shooting the next playing ball into or behind an arch, so that upon the opponent's beginning his turn, but little chance for him to advance presents itself.

Croquet tournaments are held at stated intervals at Wimbledon, England, and attract considerable attention in that country, but although challenges have been sent to the United States by some of the representative players of England, international matches have never been arranged, owing largely to the difficulty of unifying certain differences in play. The greatest of these is possibly the fact that the Englishmen play upon grass, while in the United States all championships are contested for upon dirt or clay courts.

The principal clubs of the United States are federated into the National Roque Association of America, which was organized in New York in 1882, under the name of the National American Croquet Association, which name was subsequently changed to the present one. The headquarters of the association are at Norwich, Conn., where there are eight first-class courts and a spacious and attractive club-house, in which on the Tuesday following the third Monday in August the association holds its annual meetings. During the remainder of the week the annual championship contests are held to determine the champion for the next year. There are more than two dozen clubs comprising the National Association, the more prominent being located in the following cities: Washington, Philadelphia, New Brunswick, Troy, Norwich, Middletown, New London, Chicago, Cleveland, Providence, Springfield, Asbury Grove, and Martha's Vineyard.

W. H. Wahley.

Crosby, Alpheus, American educator: b. Sandwich, N. H., 13 Oct. 1810; d. Salem, Mass., 17 April 1874. He was graduated at Dartmouth College 1827; was professor of Latin and Greek there 1833–7, and of Greek alone for nearly 20 years thereafter. In 1854 he was appointed agent of the Massachusetts Board of Education, and in 1857 became principal of the Salem Normal School, remaining such until 1865. He published several Greek and other text-books, the best of which by far were the 'Greek Grammar' (1858); and 'A Compendious Grammar of the Greek Language' (1871).

Crosby, Ernest Howard, American social reformer: b. New York 4 Nov. 1856. He is a son of Howard Crosby (q.v.) and was educated at the University of New York. He practised law in his native city 1878–89, and has since given his attention mainly to matters connected with social reform. He is the author of 'Plain Talk in Psalm and Parable' (1899); 'War Echoes'; 'Captain Jinks: Hero' (1902).

Crosby, Frances Jane Van Alstyne, American hymn writer: b. Southeast, N. Y., 24 March 1820. She became blind at the age of six months; entered the New York Institute for the Blind 1839, and was a teacher of English and history there 1847–58, when she married Alexander Van Alstyne, a blind music teacher. She has written more than 3,000 hymns, many of which have become perennially popular, and powerful aids in evangelistic work. Publications: 'The Blind Girl, and Other Poems' (1844); 'Monterey and Other Poems' (1849); 'A Wreath of Columbia's Flowers' (1858); 'Bells at Evening, and Other Poems' (1898). Of her hymns perhaps the best known are: 'Safe in the Arms of Jesus,' and 'Jesus the Water of Life Will Give.' Most of the popular ones are included in Moody and Sankey's 'Gospel Hymns,' and Sankey's 'Sacred Songs

and Solos.' Among her songs may be mentioned 'There's Music in the Air' and 'Hazel Dell.'

Crosby, Howard, American Presbyterian clergyman and scholar: b. New York 27 Feb. 1826; d. there 29 March 1891. He was graduated at the University of the City of New York in 1844, and six years later became professor of Greek there. In 1863 he was made pastor of the Fourth Avenue Presbyterian Church in New York, and thereafter was frequently a delegate to the Presbyterian General Assembly and was once its moderator. He was chancellor of the University of New York 1870–81, and a member of the American committee of revisers of the New Testament. He published: 'Lands of the Moslem' (1850); an edition of the 'Œdipus Tyrannus' (1851); 'Life of Jesus' (1871); 'Commentary on the New Testament' (1885); 'Bible View of the Jewish Church' (1888); 'The Seven Churches of Asia' (1890); etc.

Crosby, John Schuyler, American soldier: b. Watervliet, Albany County, N. Y., 19 Sept. 1839. He is a lineal descendant of the Floyds and Schuylers of the Revolutionary period. He was personal aide-de-camp to Gen. Phil Sheridan for five years during and following the Civil War, and was brevetted several times for gallantry in getting despatches through to Admiral Farragut and others, retiring from the army in 1871 as colonel. Was adjutant-general of the expeditions against hostile Indians by Gens. Sheridan, Custer, and others, and did much for peace in the disturbed West, representing the government in many conferences with Indians. In 1876 he was awarded a gold medal by Congress for saving life at sea. He was appointed consul to Florence, Italy, that same year, was territorial governor of Montana 1881–3, and first assistant postmaster-general of the United States 1883–5. Since then he has served as school commissioner of the city of New York, etc., and continues prominent in Republican politics. He is a popular orator and after-dinner speaker.

Crosby, Peirce, American naval officer: b. near Chester, Pa., 16 Jan. 1823; d. Washington, D. C., 15 June 1899. He entered the navy as midshipman in 1838, and during the Mexican war served on the Decatur and Petrel. In the spring and summer of 1861 he served in Chesapeake Bay, performing important service, and before the naval attack on forts Hatteras and Clark he superintended the landing of troops. The next year he commanded the gunboat Pinola and joining Farragut's gulf squadron, cooperated with the Itasca in breaking through the chain barrier across the Mississippi at forts Jackson and St. Philip; participated in the capture of New Orleans, and in the bombardment, passage, and repassage of the Vicksburg batteries; commanded the Metacomet (1864–5), blockading Galveston, Texas, and participated in the attack on Mobile. After the war he was commandant at various navy yards; became commodore in 1874, and rear-admiral in 1882. He commanded the South Atlantic station 1882, and Asiatic station 1883, and was retired at his own request in October 1883.

Crosby, William Otis, American geologist: b. Washington County, Ohio, 14 Jan. 1850. He was graduated at the Massachusetts Institute of Technology 1876, and has been a member of its faculty since 1883, his present position (1903) being associate professor of geology. His publications include: 'Report on the Geological Map of Massachusetts' (1876); 'Native Bitumens, and the Pitch Lake of Trinidad' (1879); 'Contributions to the Geology of Eastern Massachusetts' (1880); 'Common Minerals and Rocks' (1881; new ed. 1886); 'Dynamical and Structural Geology'; and many papers relating to his specialty.

Crosier, the pastoral staff of a bishop, symbol of his authority over his flock and of his guard over them to save them from ravage by the wolves. It is curved or crooked at the top and pointed at the lower end; and a mediæval hexameter verse indicates the significations of the staff, its crook and its sharpened lower end: *Curva trahit quos dextra regit, pars ultima pungit* — the crooked end gathers in (the lambs or sheep) that the right hand with the staff guides, the lowest part pierces — kills the wolf. The bishop of Rome alone of all bishops bears no crosier.

Crosman, Henrietta, American actress: b. Wheeling, W. Va., 2 Sept. 1870. In 1897 she was married to Maurice Campbell. She went on the stage in 1889, in Bartley Campbell's 'White Slave' Company, and in 1892–4 was Charles Frohman's leading woman. Her career as a star began under the management of her husband, Maurice Campbell, in Bronson Howard's 'One of Our Girls'; and on 9 Oct. 1900 she produced Hazleton's 'Mistress Nell' at the New York Bijou Theatre.

Cross, Charles Robert, American physicist: b. Troy, N. Y., 29 March 1848. He graduated at the Massachusetts Institute of Technology 1870, and has taught in its physical department ever since, being at the present time (1903) Thayer professor of physics, and director of the Rogers laboratory. In 1882 he established one of the first courses of electrical engineering ever given in this country, and has been in charge of it ever since. Most of his scientific papers have been published in the 'Proceedings' of the American Academy of Arts and Sciences. He is the author of the text-books: 'Course in Elementary Physics' (1873); and 'Lecture Notes on Mechanics and Optics' (1884).

Cross, Mrs. George Frederick. See CAMBRIDGE, ADA.

Cross, Mary Ann Evans. See ELIOT, GEORGE.

Cross, Wilbur Lucius, American educator: b. Mansfield, Conn., 10 April 1862. He was graduated at Yale 1885; was instructor in English in the Sheffield Scientific School 1894–7; and has been professor there from 1897. He has published: 'Development of the English Novel' (1899); and an annotated edition of 'Macbeth' (1900).

Cross, the gibbet on which Christ died; the cross was from the early days of the Church a usual emblem of Christian faith and hope, and the first Christians were wont to show great respect to its representations, with St. Paul "glorying in the cross of our Lord Jesus Christ." The gestural sign of the cross was in general use among them, so that in the 2d century Tertullian writes: "At every step

and movement, when we go in or out, when we dress or put on our shoes, at the bath, at the table, when the lights are brought, when we go to bed, when we sit down, whatever it is that occupies us, we mark the forehead with the sign of the cross." He tells us that the Christians were reproached with worshipping the cross. In the Catholic Church blessings and benedictions are always accompanied with the sign of the cross. The Church has an annual festival commemorative of the finding by St. Helena, mother of Constantine, of the cross upon which Christ died. Another festival is that of the Exaltation of the Cross, to commemorate a miraculous appearance of a cross in the heavens in 317 at the moment when Constantine was ordering his army for an attack on that of his rival, the emperor Maxentius. On Good Friday is practised the usage of the "Adoration of the Cross," when the faithful humbly and reverently by kissing the crucifix express their devotion and gratitude to the author of their redemption. In church processions the cross or the crucifix is always borne in the forefront, its bearer, the crucifer, having on his right and left an acolyte bearing a lighted torch or candles.

There are many different kinds or forms of crosses, as the common or Latin cross, or *crux capitata*, †; St. Andrew's cross, or *crux decussata*, X; the Tau cross, or cross of St. Anthony, like the letter T; the Greek cross, or cross of St. George, ┼; the Maltese cross, formed of four arrowheads meeting at the points. Two sorts of crosses are used for the forms of churches, the Greek and the Latin. Bramante originally designed St. Peter's at Rome for a Latin cross; Michael Angelo reduced it to the proportions of the Greek cross; but Carlo Maderno again elongated it to the original dimensions of Bramante. The cathedral of St. Paul's London, is a Latin cross, with its base spread by a sort of second transept, which increases the breadth of the western front.

Market crosses are crosses which were erected in the markets or trading place to remind people to so deal with their customers as to be Christ-like. Most market-towns in England and Scotland formerly had their crosses, and many of them are still in existence. Some of the chief are those of Bristol, Chichester, Cheddar, Edinburgh, Malmesbury, and Winchester.

Cross, in heraldry, the chief of the honorable ordinaries, occupying one fifth of the field when uncharged, but one third when charged. The cross may be engrailed, invested, couped, etc., like other ordinaries. Various modified crosses are also used in heraldry, such as the cross calvary, a Latin cross on three steps; cross bottonnée or trefflée, having each end terminating in a trefoil; cross crosslet, with the four ends crossed; cross fleury, having each end capped by a fleur-de-lis; cross fourchée, with each end forked; cross moline, with the ends curved out both ways; cross patée, widening from the centre to the ends.

Cross-bearer, in the Roman Catholic Church, a functionary who carries a cross in the more solemn processions; the cross-bearer is generally a sub-deacon. See Cross.

Cross-bow, or **Arbalist**, formerly a very common weapon for shooting, but not long used in war after the invention of firearms. It was a strong wooden or steel bow fixed to a stock, having the bowstring stretched by lever power, and shot off by the trigger fixed to the stock. All kinds of weapons in which the bow was fastened to the stock were called cross-bows, some of which were attached to wheeled supports, and drawn by horses.

Cross-examination, the questioning of a witness by the party or the counsel of the party against whom he has been called to testify.

Cross-fertilization is a term used mainly by botanists and horticulturists; and in a strict sense, applies to the fertilization of the ovules of one seedling plant by pollen from another seedling plant. In a rather loose way, it is sometimes used to refer to the cross-pollination of a flower with pollen from a different flower on the same plant, but its use in this sense is erroneous, as the act of cross-pollination in this case does not give cross-fertilization, or cross-fecundation. "Cross-fertilization," as used by Darwin in his classical work on this subject, to quote his words, "always means a cross between distinct plants which were raised from seed and not from cuttings or bulbs." Plants raised from cuttings or bulbs may possibly have been derived from the same seedling, and flowers fecundated with pollen from different plants thus derived would not be cross-fertilized.

In animals and man cross-fertilization means the crossing of different races or miscegenation in opposition to inbreeding. Here close- or self-fertilization, such as occurs commonly in plants, is impossible in almost all cases, as only a few animals are hermaphrodite, having both male and female organs, while this phenomenon is common in plants. In animals and man, therefore, cross-fertilization has a somewhat different meaning than when used in reference to plants. In plants, however, as in animals, if individuals of different races or species are bred together, they are said to be cross-fertilized, in contradistinction to self-fertilized.

The indefinite way in which the terms self-fertilization and cross-fertilization have been used makes it desirable to recognize a clear limitation as to their meaning. Self-fertilization should be used to mean the fertilization of an ovule by pollen from the same or a different flower on the same seedling individual; while cross-fertilization should be restricted so as to mean the fertilization of an ovule by pollen from a different seedling individual of the same strain, race, or species, or of a different strain, race, or species.

CROSS-FERTILIZATION IN PLANTS.

Methods by which cross-fertilization is accomplished.—While a knowledge of the sex distinction of animals dates from the dawn of human history, the sexuality of plants remained unknown until about two centuries ago. Experimental proof of the sexuality of plants was published for the first time by Camerarius in 1691, and only after this discovery was the function of pollen known and its necessity in seed formation recognized. The first recorded hybrid was made by Thomas Fairchild about 1711, and very careful studies of plant hybrids were published by Koelreuter in 1760. With all this accumulating knowledge of the sexuality and

crossing of plants, it is surprising that the true meaning and significance of the flower and its various adaptations to secure cross-fertilization was not perceived until Christian Conrad Sprengel completed his researches and in 1793 published his now classical work entitled, 'The Secret of Nature Discovered in the Form and Fertilization of Flowers.' Sprengel discovered the principal facts connected with the cross-pollination of flowers by insects. He recognized the true significance of honey and of bright-colored flowers, that they were but means to attract insects to the flowers and that the insects carried pollen from one plant to another and aided in securing cross-fertilization. He, however, failed to recognize that the plant derived any benefit from the cross-fertilization. It was left for Charles Darwin, the great English naturalist, to point out that certain species of flowers are entirely dependent for fertilization on the transfer of the pollen from one plant to another and that self-fertilization is in the majority of cases actually injurious, resulting in loss of vigor in the progeny. The transfer of pollen in cross-fertilized plants is generally accomplished through the agency of the wind, water, insects, or birds, and the various devices that have been adopted by the plant to secure crossing, form an interesting and inexhaustible field for study and observation.

Wind fertilized, or anemophilous flowers are those so modified as to depend upon the wind to secure cross-fertilization by carrying the pollen of one plant to the stigmas of another. Anemophilous plants are characterized by having dry and powdery pollen, which is very abundant and light and easily carried by the wind. In most cases also the pistils are large and feathery, with large, sticky stigmas, presenting an abundant surface to catch the pollen floating in the air. In wind-fertilized plants there is a great opportunity for loss of pollen and it thus becomes necessary that an abundant supply should be formed. The various pine-trees, of which there are large forests in some parts of America, are wind-fertilized and form enormous masses of pollen. In this case, the pollen grains are provided with two lateral wing-like extensions which are supposed to be of service in making the pollen lighter and easier to blow about. Several instances are recorded where the decks of vessels at sea have been covered by a rain of pollen which, in some cases, must have been carried a distance of some 400 miles. Corn, or maize, forms a familiar example of a wind-fertilized plant. The pollen is produced in great abundance in the stamens of the tassel, which forms the upper part of the stalk. When the pollen is mature the stamens protrude from the flower and the slightest jarring of the plant by the wind causes the pollen to fall in a cloud, and as the plants are grown near together, some grains are almost certain to lodge on the pistils, or silks, of the ear of another plant. The silks are long and are covered with numerous stigmatic hairs so that the opportunity for plants to catch floating pollen and be cross-fertilized, in an ordinary field where numerous plants are grown, is very great. Experiments prove that cross-pollination is so universal that it is very difficult to keep varieties of corn pure. If different varieties are grown near each other cross-fertilization is certain to occur and impure seed results. Vilmorin found by careful experiments that plants of different varieties have to be separated by at least 1,000 feet to prevent cross-fertilization, and this distance is by no means sufficient if strong winds blow over one field of corn in such a direction as to carry the pollen from it toward another field of corn. Nevertheless it is well known that a number of plants must be planted near together to insure thorough pollination. Plants standing alone at a distance from other corn plants seldom produce well-filled ears. The flowers of wind-fertilized plants are usually green, or greenish, inconspicuous, and have no odor or nectar. The flowers are ordinarily regular in form and they frequently appear before the leaves, though this is by no means universal.

Water-fertilized, or hydrophilous, plants, are those in which the pollen is transferred through the agency of water, and are not very common. Following Delphino, they may be divided into two types: the first type includes *Zostera*, *Posidonia*, etc., and the *Florideæ*, where the pollen is of the same specific gravity as water, and is carried here and there by water currents; the second type includes such plants as *Ruppia* and *Vallisneria*, in which the pollen is lighter than water, or is borne on a floating raft formed by the loosened flower. The peduncles of the female flowers elongate and bring them to the surface of the water where their position allows the stigma to be pollinated by the floating pollen.

By far the greatest number of plants that require cross-fertilization depend upon insects as pollen carriers, and these plants have been termed entomophilous. Such plants are characterized by the large size, showy colors, and markings of their flowers and their odor, which serve to advertise the nectar and nourishing pollen that the flower contains and thus attract insects to the flower. The insects in passing from flower to flower in search of nectar and pollen become useful to the plant by incidentally transferring pollen from one flower to the stigmas of other flowers, thus causing cross-fertilization. Flowers have in many cases become adapted to certain insects and have stamens and pistils developed in the position best suited to insure pollination when these insects visit the flowers for nectar or pollen. Many insects depend wholly, or in large part, on the nectar and pollen of flowers as food, and such insects usually visit only one kind of flower during the day and therefore carry but one kind of pollen. They work systematically, passing from one flower to another, and clearly do an enormous amount of crossing and waste less pollen than the wind or water. Some insects, like certain beetles, have smooth bodies and carry but little pollen, but many beetles, and all bees, moths, butterflies, etc., have their bodies, wings, and limbs, roughened with hairs and scales, and these collect and retain a large quantity of pollen ready to be left on the sticky stigmatic surface of the pistil of the flower when the insect rubs against it. The nectar glands of the flower are usually located in such a position that the insect in getting to them to suck the nectar must enter the flower in the best way to insure cross-pollination. Insects are greatly attracted by odors, and the flowers of many plants have a strong scent which serves to make them more attractive. The evening primrose (*Œnothera*), which opens early in the evening and is fertilized by night-flying moths, has a very strong odor, and the

same is true of many night-fertilized flowers, such as the honeysuckle (*Lonicera caprifolium*), night-blooming Cereus, etc. Night-blooming flowers which are fertilized by insects are principally white and generally more sweet-scented than day-blooming flowers. Some flowers, such as the Stapelias, are purplish or brownish, resemble decayed flesh in appearance and are carrion-scented to attract carrion flies. Certain insects are attracted by certain colors more than others. The favorite color of the honey-bee, for instance, is deep bluish-violet, while pure blue and violet are pleasing. Yellow is less sought, but is not avoided, while red is disliked and shunned. Kerner states that in the Vienna Botanical Gardens the honey-bees in great numbers visit the bluish-violet flowers of *Monarda fistulosa*, and the blue flowers of the hyssop (*Hysopus officinalis*), but avoid the scarlet flowers of the *Monarda didyma*. In some plants the involucre, or whorl of leaves below the flower, is highly colored and takes the place of the colored parts of the flower. Such is the case in some *Euphorbias* such as snow-on-the-mountain, which is nearly white, and the poinsetta (*E. pulcherrima*), in which the involucre is red. In a large number of cases the petals of large flowered species show spots or lines on the main part of the flower of different color from the main ground color of the petals. These are usually known as nectar guides and are believed to be of service in aiding insects to find the nectar.

One of the most interesting and instructive modifications to secure cross-fertilization is the formation on different plants of flowers with different lengths of stamens and styles. Sprengel noted that some plants in *Hottonia* bear only flowers whose anthers are included in the tube, but whose style is exserted; while other plants bear only flowers having short styles and long stamens, longer than the flowing tube. He was, however, unable to suggest any reason for such variations. Some plants, such as *Lythrum*, regularly show these different lengths of stamen and style. Darwin subjected the peculiar sexual relations of these plants, which he called dimorphic and trimorphic, to most careful and extensive research, crossing the different forms back and forth in various ways. The results of these researches are summarized below.

In dimorphic plants, such as *Primula* and *Linum*, two forms exist in about equal number and usually growing together. In one form the plants have flowers with a long style extending considerably beyond the short stamens, while in the other form, the position is reversed, the style being short and the stamens long. In the long-styled form the stigma is rough and furnished with long papillæ, and the pollen grains are small, while in the short-styled form the papillæ of the stigma are short and the pollen grains are larger (Fig. 3). In the trimorphic heterostyled plants of *Lythrum salicaria* three lengths of styles are formed, long-styled, mid-styled, and short-styled (Fig. 1). In each form the stamens exist in groups of two lengths corresponding to the two other lengths in which the styles occur in other plants. The longest stamens produce the largest pollen grains, the shortest stamens produce the smallest grains. When insects visit the dimorphic and trimorphic flowers, their organs become dusted with the pollen at certain heights. When they later visit other plants with other lengths of styles, this pollen will be at the exact position and height to best cause cross-fertilization. In such crossing a pistil always receives pollen from stamens of corresponding heights and the size of the pollen gram is thus proportional to the length of the style which its tube must traverse. Such crossing Darwin called legitimate. When a pistil of a dimorphic or trimorphic flower is crossed with pollen from stamens of different heights he termed it illegitimate fertilization. By very careful experiments Darwin found that only seeds produced as a result of legitimate crossing give completely normal and fertile plants. Illegitimate crossing leads to the production of progeny with all degrees of diminished sterility or even complete barrenness and give offspring which have all the characters of hybrids produced by the union of different species.

Aside from the classes above mentioned a few plants are specially adapted to cross-fertilization by small birds and snails, but such plants



FIG. 1.— Trimorphic flower of *Lythrum salicaria* L; *a*, long-styled flower; *b*, mid-styled flower; *c*, short-styled flower; with one-third of calyx, corolla, and stamens removed in each case. (After Müller.)

are few in number and their modifications are similar to those adapted by plants which are fertilized by insects.

Prepotent Pollen.— The great majority of plants that have devices to secure cross-pollination also have some modification that insures self-fertilization. This in a way would seem to have been developed as a safeguard to insure seed development should cross-pollination fail to take place. In most cases the self-pollination takes place before or about the same time as the cross-pollination, and it would seem that in such cases where the plants are not self-sterile that a large majority of self-fertilized seeds would be formed. However, it has been found in many cases that the pollen of a different plant of the same race or species or in some cases of a different race will be prepotent over the plant's own pollen. In one instance, Darwin selected two flowers which had only recently opened on a plant of a variety of cabbage, known as "Ragged Jack," and abundantly pollinated them with pollen from the same plant. After an interval of two or three hours pollen of a different variety, known as "Early Barnes," was dusted on the stigmas of the same flowers. Under the circumstances it would seem that little effect could be expected from the pollen of the Barnes cabbage, yet 3 out of the 15 plants raised from the

seed formed by the above two flowers, showed plainly that they were hybrids.

A similar experiment was carried out by the writer with cotton. A bud of Sea Island cotton (*Gossypium barbadense*) was covered with a manila paper bag before it had opened. Early in the morning, when the flowers of cotton normally open and are pollinated, the bag was removed and the stigma abundantly dusted with pollen from the same flower, after which the bag was replaced. Cotton is abundantly self-fertile, only about 5 per cent of the flowers being normally cross-fertilized under the most favorable circumstances, so that this capsule should have set the normal number of seeds without further pollination. After four hours the bag was removed and the same stigma dusted with pollen of upland cotton (*G. herbaceum*), which belongs to a different but nearly related species. The seed of this Sea Island capsule gave five plants, of which three were clearly hybrids.

The prepotency of pollen can be easily observed where different races or varieties are concerned, but in cases where the pollen of a different plant of the same race or species is prepotent over the plant's own pollen, as is not infrequently the case, the fact is not so easy to prove. Darwin demonstrated prepotency in a number of cases of this kind, using as his guide the superiority of seedlings raised from cross-fertilized seed to those resulting from self-fertilization, which after a few experiments can be used as a fairly safe index.

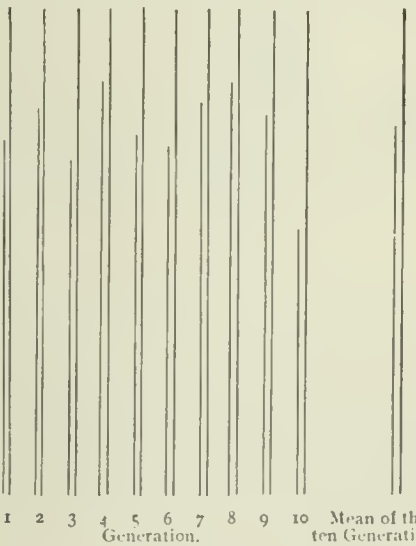


FIG. 2.— Diagram showing the mean heights of cross- and self-fertilized plants of *Ipomœa purpurea* in ten generations, the mean height of the crossed plants being taken as 100; on the right hand are shown the mean heights of the cross- and self-fertilized plants of the ten generations taken together. (After Darwin.)

Benefits of Cross-fertilization.— The benefit derived from cross-fertilization in the case of plants was first clearly brought forward through the classical treatise of Charles Darwin on "The Effects of Cross- and Self-fertilization in the Vegetable Kingdom." Sprengel at times apparently foresaw this law, but he seems never to have grasped its full significance. In one place he states "it appears that nature has not willed that one flower should be fertilized by its own pollen," yet he failed to realize that this carrying of pollen from one flower to another was of any service to the plants themselves. Knight, Koelreuter, and Herbert plainly had the main features of this law in mind, but did not recognize it as of sufficient importance to give it special attention. Darwin carried on extensive experiments to demonstrate the effect of cross- and self-fertilization in various plants and his conclusions are generally accepted to-day. His general plan of experimenting was to grow cross- and self-fertilized seed of the same plant in the same pot on opposite sides, with a partition between them. They were carefully watched and as often as one on each side germinated at the same time they were transplanted to another pot and again placed on opposite sides of a superficial partition.

The increased vigor and productiveness due to cross-fertilization may be illustrated by Darwin's experiments with the morning-glory (*Ipomœa purpurea*). The experiments were carried to the tenth generation and in each generation the height of the cross-fertilized plants greatly exceeded that of the self-fertilized plants (Fig. 2). The ratios between the average heights of cross- and self-fertilized plants in the different generations were as follows:

1st generation, as 100 to 76.
2nd generation, as 100 to 79.
3rd generation, as 100 to 68.
4th generation, as 100 to 86.
5th generation, as 100 to 75.
6th generation, as 100 to 72.
7th generation, as 100 to 81.
8th generation, as 100 to 85.
9th generation, as 100 to 79.
10th generation, as 100 to 54.

The average ratio of height during the 10 generations was 100 to 77. The same vigor and superiority of the cross-fertilized plants was also shown in all other features, such as the number of capsules and seed, constitutional vigor, etc., in fully as marked a proportion as was shown in increased height. Similar superiority of cross-fertilized over self-fertilized plants has been demonstrated to occur in *Mimulus, Digitalis, Verbascum, Papaver,* and many other plants, and the rule may be considered a general one.

Darwin's experiments with the common garden pea, however, forms an exception of some interest. Here the average height of the cross-fertilized plants was 34.62 inches and that of the self-fertilized plants 39.68 inches, or in the proportion of 100 to 115. The pea, however, is a plant which is normally self-fertilized, crossing rarely occurring. The plant has therefore become adapted to self-fertilization, and does not lose vigor as a result. The lack of vigor shown by the cross-fertilized progeny would indicate that such plants which are normally self-fertilized may have assumed this habit through some benefit derived from the self-fertilization and would thus be injured as a result of crossing. Wheat, barley, and oats, among the cereals, are almost wholly self-fertilized, crossing very seldom occurring. As a result of experiments conducted

by Professor Hays, of the Minnesota Agricultural Experiment Station, it has been shown that the artificial crossing in wheat of individuals of the same race, or of different races, almost invariably results in decreased fertility as a whole, although as a result of crossing distinct races, certain individuals with increased fertility can be selected.

It has been said by Nægeli that "the consequences of fertilization reach their optimum when a certain mean difference in the origin of the sexual cells is attained"; and by Fritz Müller, that "every plant requires, for the production of the strongest possible and most prolific progeny, a certain amount of difference between the male and female elements which unite. Fertility is diminished as well when this degree is too low (in relatives too closely related) as when it is too high (in those too little related)." Darwin says: "The offspring from the union of distinct individuals, especially if their progenitors have been subjected to very different conditions, have an immense advantage in height, weight, constitutional vigor, and fertility over the self-fertilized offspring from one of the same parents."

Attention has been called by Willis to three factors in the gain resulting from cross-fertilization, namely, *a*, fertility of mother plant; *b*, vigor of offspring; and *c*, fertility of offspring. The relative value of these factors varies with different plants. In the carnation, for instance, factor *a* of cross fertilized plants was 9 per cent greater than in self-fertilized plants, *b* was 16 per cent greater, and *c* was 54 per cent greater; in tobacco, factor *a* was 33 per cent less than in self-fertilized plants, but factor *b* was 28 per cent greater, and factor *c* 3 per cent greater. Even when the fertility of the mother-plant is greatly reduced by hybridizing with a distinct species and the hybrids themselves are sterile or very infertile they nevertheless often show extraordinary vigor, that is, *b* is often greater in hybrids than in pure bred plants, but factors *a* and *c* show usually less.

In plant breeding the importance of the increased vigor resulting from cross-fertilization is very great. In cases where there is no particular object in keeping the varieties pure, a marked increase in yield may be obtained by using crossed seed. The practical value of this fact is indicated by results obtained at the Illinois Experiment Station by Morrow and Gardner in crossing various races of corn. Of 15 cross-bred corns tested, 12 gave a decided increase in yield over that of the parent sorts, ranging from 2 to 86 per cent in individual cases. In three cases a decrease in yield of from 8 to 20 per cent resulted. In the 15 cases taken together an average increase in yield of about 10 per cent was secured. In some cases the cross bred corns were grown to the second generation without crossing and showed a decidedly larger yield than the parent varieties. A number of crossing experiments of a similar nature had previously been made by McCluer with corn and practically the same results obtained. McCluer states that, "The corn grown from the crossed seed was in nearly all cases clearly increased in size as a result of crossing," and that "nearly all the corn grown a second year from the crosses is smaller than that grown the first year, though most of it is yet larger than the average size of the parent varieties."

In maize, the loss of vigor caused by close in-breeding was found in experiments conducted by the writer, in conjunction with Mr. C. P. Hartley, to be very marked. Seeds of Hickory King, a race grown commonly in the Eastern States, produced by in breeding with pollen of the same stalk, yielded the next year at the rate per 100 stalks of 36 ears, weighing 9⅓ pounds. Seeds of the same race, in every way comparable, but produced by crossing different seedlings, yielded under the same conditions at the rate per 100 stalks of 82 ears, weighing 27½ pounds. In

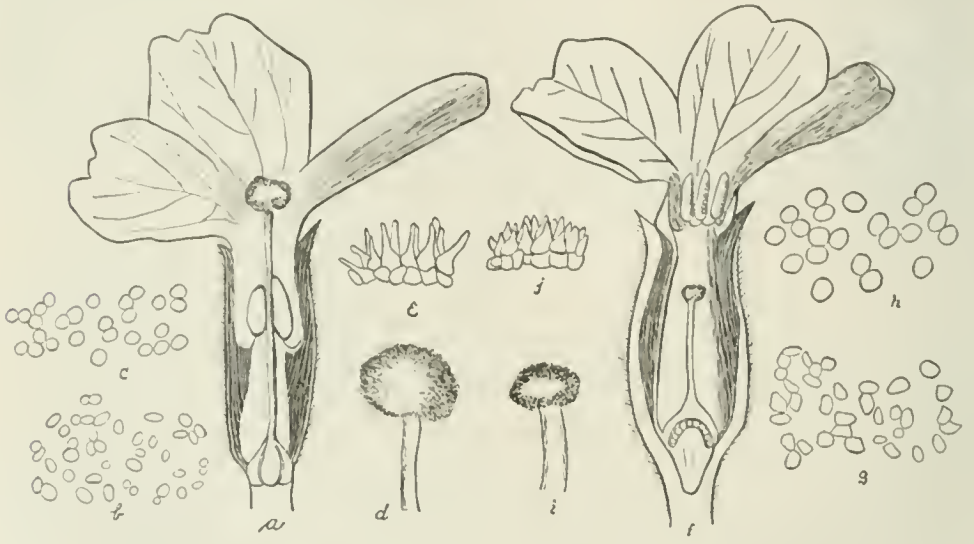


FIG. 3.— *Primula elatior*; *a–e* long-styled flower; *f–j*, short-styled flower; *b* and *g*, pollen grains dry; *c* and *h*, pollen grains moist; *d* and *i*, stigmas; *e* and *j*, stigmatic papillæ. (After Muller.)

attempting to fix hybrids of Hickory King crossed with Cuzco or Peruvian corn, some ears were inbred with pollen from the stalks bearing them, while others were pollinated from other hybrid seedlings of the same parentage. The hybrids of the second generation, where the seed was inbred with pollen from the same stalk, showed great loss of vigor, being small in stature and almost totally sterile; while those produced from seed which was inbred with pollen from a different seedling were much more vigorous and productive, seeming to have lost but little by this process of inbreeding. In the majority of cases crossing distinct sorts improves the vigor and results in greatly increased yield. By selecting varieties which have increased yields uniformly when crossed and crossing these for seed corn, it seems certain that the average yield can be greatly increased. Securing seed corn from a cross of any two races desired is not a difficult or expensive process, being easily accomplished by planting the two desired sorts in alternate rows and removing the tassels, as soon as they appear, from the one to be used as the female parent. The ears that form on the rows from which the tassels have been removed will have been crossed with pollen from the variety from which the tassels have not been removed. The seed corn should therefore be selected from the ears produced on the detasseled rows. The field planted to the two varieties, as above described, to secure crossed seed should be somewhat isolated from other cornfields, and should be of sufficient size to produce the necessary quantity of seed. The only extra expense incurred in producing seed corn in this way is the cost of detasseling the alternate rows, as ears will form on both as usual.

The increased vigor and fruitfulness which almost invariably result from crossing closely related sorts or varieties is a principle of the utmost importance in our common agricultural practices, for there is a great need for more vigorous forage plants, timber and shade trees, vegetables, etc., and more prolific grains and fruits.

Self-sterile Plants.—Some plants have become so completely modified for cross-fertilization that they are sterile to their own poller and will not set seed unless cross-fertilized. Of our wild plants this has been found to be the case in a number of instances. Koelreuter and Gärtner long ago found that some plants, namely, *Verbascum phœniceum*, *V. nigrum*, and *Lobelia fulgens*, under certain conditions were sterile to their own pollen, but would set seed abundantly when crossed with pollen of other species. Fritz Müller proved by careful experiment that *Eschscholtzia californica*, *Abutilon Darwinii*, and a species of begonia were sterile to their own pollen, whether fertilized with pollen from the same flower or from different flowers on the same plant, but were perfectly fertile when cross-pollinated with pollen from other plants. Darwin found that these plants in England were also largely self-sterile, but that under certain conditions the degree of fertility with their own pollen could be greatly increased. The same phenomenon of self-sterility and necessity for cross-pollination is shown by some of our important cultivated plants. Mr. M. B. Waite has demonstrated that many of the varieties of pears, such as Bartlett, Anjou, etc., are largely self-sterile, producing few or no fruits when pollinated only with pollen of the same variety. In the case of varieties of pears and fruits of this kind that are propagated altogether by budding, as is well known, all of the various trees of the variety that exist are simply parts of the same individual, so that pollinating flowers on one Bartlett pear-tree with pollen from another Bartlett pear-tree is in effect the same as pollinating one flower on a plant with pollen from a different flower on the same plant and is what we recognize as self-fertilization. Mr. Waite and others have shown that when such sterile varieties are pollinated from a different horticultural variety, which in reality is simply a different individual of the same species, they are rendered perfectly fertile. This discovery has proved of great practical value, as many pear orchards were planted with trees of a single variety like the Bartlett and were found for some unknown cause to be very unfruitful. Waite's discovery showed the true cause of this lack of fruitfulness and at the same time pointed out the natural and simple remedy of cross-fertilization. All that remained to be done in such barren orchards was to bud some of the trees over with buds of varieties which had by experiment been found to produce a good percentage of fertility in crossing on the variety concerned. Since Waite's discovery of the reason for the barrenness of certain varieties of pears many experiments have been conducted by different investigators. It is now known as a result of experiments by Waite, Waugh, Beach, and others that many varieties of plum and apple are largely sterile to their own pollen and require cross-pollination for complete fruitfulness.

The pineapple, also, as shown by the writer's studies is an interesting example of a self-sterile plant. Ordinarily the pineapple is wholly seedless, yet the flowers are so arranged that they are abundantly fertilized with their own pollen. The self-sterility is so perfect that even under these circumstances, seeds set so rarely that few growers and consumers have ever seen seeds. In experiments in crossing various varieties it was found that when certain varieties were crossed seeds were formed in abundance, showing that cross-fertilization is necessary to insure the development of perfect seeds. The explanation for the setting of such few seeds in cultivation normally is probably to be found in the fact that the proper insect pollinators are not present, and the flowers are therefore not cross-fertilized.

CROSS-FERTILIZATION IN ANIMALS AND IN MAN.

In animals and man, as stated above, cross-fertilization means the crossing of individuals of different races or breeds in contradistinction to in-and-inbreeding in which different closely related individuals of the same race or breed are bred together. With animals as with plants, benefit results from occasional cross-fertilization, at least within certain limits. The evil effect from the closest possible inbreeding with animals, however, is not nearly so marked as in plants and in some cases its deleterious effect is hardly apparent. Inbreeding, interbreeding, or close breeding, which means the breeding together of closely related animals at rather distant or long intervals, and not every generation, seldom or never results in evil effect. It is the continuous

in and inbreeding of closely related individuals, generation after generation, without intermission, that is claimed by some to lead to evil effects. The opponents of in-and-inbreeding claim that it results in delicacy of constitution, predisposition to disease, lack of fecundity, etc. It must be admitted that those breeders who have used in-and-inbreeding the most, use the method as a means to an end and not because they believe primarily in any beneficial result of in-and-inbreeding in itself. As a result of long experience in the fixation of desirable characters it has been found that this is the surest and best way to render a character prepotent. It is used, therefore, as a means of strengthening the transmitting power or prepotency of a character, which otherwise in most instances would be lost. Miles states that "From a careful examination of the pedigrees . . . that may be found in the herd books and breeding-registers, representing the practice of breeders of acknowledged reputation, it will be found that in-and-inbreeding has only been resorted to in the case of some favorite animal or animals that were superior in certain respects to the average members of the herd or family which they represent, and the object has evidently been to secure in the offspring a predominance of their most highly valued characters." In most instances the older original character is more strongly hereditary and it is only by in-and-inbreeding that a new character can be rendered stable and prepotent and prevented from being swamped and lost. Such new characters in some cases have by this means been so strengthened that they dominate even the original and older characters. In regard to the belief that in-and-inbreeding leads to sterility and predisposition to disease, a careful consideration of the evidence at command leaves the student in doubt as to the conclusion to be drawn. Although in some instances there is a tendency to sterility, in other cases full fertility is maintained and the same conflicting statements may be made regarding weakness and tendency to disease. The facts seem to indicate that close breeding or in-and-inbreeding in itself is not injurious, but may be very detrimental in some cases, as it tends to perpetuate any constitutional defects which may have been produced by other agencies. In-and-inbreeding should always be accompanied by the closest selection of the best animals free from constitutional weakness or disease. The greatest objection to in-and-inbreeding lies first in the difficulty experienced in selecting breeding animals that are free from any constitutional weakness, as such defects frequently do not become distinguishable till after the breeding has progressed several years; and second in the danger that such defects may become dominant in the offspring. It must be admitted, however, that when used judiciously in-and-inbreeding forms an important means of securing improvements and is the only known means of fixing and rendering slight variations hereditary.

The majority of our various breeds of cattle have been brought up and improved as a result of very close inbreeding. As an illustration, the famous shorthorn bull, Favorite, was bred to his daughter, granddaughter, and great-granddaughter, and the product of the last union was matched with the bull Wellington, having 62.5 per cent of the blood of Favorite. Clarissa, the offspring of the last union was bred with the bull Lancaster, having 68.75 per cent of the blood of Favorite and gave very valuable offspring. The majority of our best breeds of animals have been very closely in and-inbred without very noticeable deterioration in any direction except possibility in fecundity. It must be borne in mind, however, that this in-and-inbreeding has at every step been accompanied by the most rigorous selection, only the very best animals being retained for further breeding. Darwin says that "Although by careful selection of the best animals, close interbreeding may be long carried on with cattle, yet the good effects of a cross between almost any two breeds is at once shown by the greater size and vigor of the offspring; as Mr. Spooner writes to me 'Crossing distinct breeds certainly improves cattle for the butcher.'" The benefits of crossing are particularly visible when following extended in-and-inbreeding.

In the case of man, where families have interbred very closely, as has sometimes occurred, there is said to be a great gain in vigor as a result of intermarriage with a distinctly different family. The hardihood and general vigor of the Americans as a nation is commonly attributed to the great intermixture of peoples of many different nationalities. The mixture of European races has been going on from prehistoric times, and the population is of highly composite character. The results of mixtures of the various strains, breeds, or stocks of the white race are without doubt very beneficial, resulting in increased strength and vigor, and the same can be said of the intermixtures of the various strains or stocks of the yellow, brown, or black races. Here as in plants Nature abhors too close interbreeding. On the other hand, inter-racial marriage, or miscegenation, the marriage of individuals of distinct races, as a whole, results very disastrously both as to physical and mental characteristics. The result of such a union is a hybrid, frequently sterile, mainly intermediate in characters between the two races, and usually in large measure a social outcast. Such half-breeds or hybrids are in general inferior to the pure parental races, particularly in physical vigor, though mentally they may be equal or possibly superior. In crosses, for instance, of the negro and white races, the offspring commonly shows a tendency toward sterility and are in general weak in constitution.

In conclusion it may be stated that injury results on the one hand from too close inbreeding and on the other hand from crossing races too distinct, but that the crossing of slightly distinct strains and of individuals, reared under different conditions, is beneficial. See FERTILIZATION.

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U. S. Department of Agriculture.

Cross-fire, the combination of intersecting lines of fire from two or more parts of a work. It is frequently made use of to prevent an enemy's passing through a defile. The flanks as well as the faces of two adjoining bastions afford the means of cross-fire, as do also the faces of two adjoining redoubts.

Cross-fox, a peculiarly marked northern variety of the American red fox. It has a dark line along the back, and crossing this a stripe on the withers. This gives its name. Its rarity and beauty make its skin more valuable than is the pelt of the ordinary fox.

Cross Keys, Va., a place in Rockingham County, 20 miles northeast of Staunton, where a battle took place 8 June 1862, between the Union and Confederate forces. The former numbered about 18,000 under Gen. Fremont and lost 625 men; the latter had about 8,000 men under Gen. Ewell and lost 287.

Cross Keys, Battle of. On the morning of 8 June 1862 Gen. Frémont, with 10,500 men and 44 guns marched from Harrisonburg, Virginia, following Gen. "Stonewall" Jackson, who had been pursued up the Shenandoah valley, and who had now fallen back in the direction of Port Republic. Frémont's cavalry drove in Jackson's, and when eight miles beyond Harrisonburg Cluseret's brigade, in advance, came upon Gen. Ewell's division of about 5,000 men and 16 guns, at Cross Keys, and Frémont formed for attack. Cluseret's brigade, with artillery, was on and near the road, Stahel's and Bohlen's were sent on the left; Milroy's and Schenck's on the right. Eight batteries were put on the line and opened a spirited fire. Stahel was now ordered to attack Ewell's right and, going forward, met with some success, but when his two left regiments were ascending a gentle slope and had approached within a few feet of its summit, Ewell's men opened with an unexpected and severe fire, and the regiments were repulsed with great loss. Part of Ewell's line pursued, but was checked and driven back by Stahel's right regiment, which was concealed in the woods. Bohlen's brigade was now ordered forward, but under conflicting orders it was misdirected, and for the most part remained as support to the batteries. Re-enforcing his own right, Ewell advanced beyond Frémont's left, got an enfilading fire on his batteries, which, not properly supported, were withdrawn, the infantry following a full mile. Meanwhile on the right Milroy and Schenck had made some progress, and were preparing to make a determined attack on Ewell's left, when Frémont ordered them to fall back and re-enforce his left, but by this time his left had been forced back, and the entire line fell back at 6 P.M. to organize for a renewal of the battle in the morning. During the night and early in the morning Ewell withdrew, under Jackson's order, to join in an attack on Gen. Shields, who was nearing Port Republic by way of Luray Valley. Frémont followed Ewell to the south fork of the Shenandoah, to find that he had burned the bridge behind him and joined Jackson. He was an idle spectator of the battle of Port Republic, 9 June, in which his comrades were defeated, and the day following he returned to Harrisonburg. The Union loss at Cross Keys was 558 killed and wounded and 127 missing. The Confederate loss was 273 killed and wounded, and 15 missing. Consult: 'Official Records,' Vol. XII.

E. A. CARMAN.

Cross, The Southern. See SOUTHERN CROSS.

Cross, Victoria. See VICTORIA CROSS.

Cross Vine. See BIGNONIA.

Crossbar Shot, a projectile constructed in such a manner as to expand on leaving the gun into the form of a cross with one quarter of the ball at the end of each arm,— formerly used at sea for injuring the enemy's rigging, and doing general execution.

Crossbill, a bird of the genus *Loxia* belonging to the finch family (*Fringillidæ*) and unique from the character of the bill the two mandibles of which are twisted awry so that they cross. This peculiarity has given rise to a well-known and pretty legend to the effect that the crossed beaks is a mark of the bird's pity in having attempted to draw the nails which held Jesus' hands and feet to the cross, and that the red plumage of some species is the dye of his blood. This singular structure, having the appearance of a deformity, is in reality a wonderfully efficient mechanism for tearing asunder and extracting the seeds of pine cones on which these birds largely feed. Two species belong to the North American fauna, the red crossbill (*L. curvirostra*) and the white-winged crossbill (*L. leucoptera*). Both are birds of the northern pine and spruce forests, breeding within the United States, which they do in the very early spring, and only in the extreme northern States and the higher mountains. They are better known as irregular winter wanderers, which appear in flocks usually containing both species, remain in a neighborhood until they have devoured all of the seeds of conifers which are to be found, and then leave. Closely related species are found in Europe and Asia.

Crossbuns, small cakes specially prepared for Good Friday, and in many towns of England cried about the streets on the morning of that day as "hot crossbuns." Good Friday buns were appropriately marked with the cross, and hence the name. At Chelsea there were formerly two celebrated bun-houses, besieged on Good Friday from morning till night by hundreds of eager purchasers, but they have long since disappeared. In many of the cities of the United States, "hot crossbuns" are becoming quite common the last days of Lent.

Crosse, Andrew, English physician and scientist: b. Broomfield, Somerset, 17 June 1784; d. there 6 July 1855. He passed the greater part of his life experimenting in electricity. In 1816 he asserted that by electricity it was possible to communicate one's thoughts instantaneously to persons in the most distant parts of the earth, but he never appears to have attempted to demonstrate the fact by actual experiment. Among other things he applied electricity in the production of crystals, discovered

a process of purifying salt water by electricity, and also made some curious discoveries relative to the effects of positive and negative electricity on vegetation.

Croswell, Edwin, American journalist: b. Catskill, N. Y., 20 May 1797; d. Princeton, N. J., 13 June 1871. His able management of his father's paper, the 'Catskill Recorder,' led Martin Van Buren and other prominent Democrats to invite him to become editor of the Albany *Argus*, and also State printer 1824. During his 30 years' control he made it one of the most influential Democratic papers in America, and as a member of the political group known as the "Albany Regency," he preserved order in the party ranks through the columns of his paper. His articles were regarded as authoritative and were widely copied. Subsequently he found himself opposed to Van Buren and other early friends, and leaving journalism (1854) went into business in New York.

Croswell, Harry, American writer and clergyman: b. West Hartford, Conn., 16 June 1778; d. New Haven, Conn., 13 March 1858. He first came into notice as a Federalist editor of The Balance, a newspaper published in Hudson, N. Y. (1802), his bitter and sarcastic editorials involving him in numerous libel suits. Alexander Hamilton's last, and one of his finest, forensic efforts, was made in defense of Croswell in a suit caused by an article on Jefferson. He entered the Episcopal ministry in 1814, became rector of Trinity Church, New Haven, Conn., 1 Jan. 1815, and remained there until his death. He published: 'Young Churchman's Guide' (1838); 'Family Prayer' (1843); 'Memoir of Rev. W. Croswell' (1853); 'Guide to the Holy Sacraments' (1857).

Crotalaria, krō-ta-lā'rĭ-a, or **Rattle-box,** a genus of annual and perennial herbs and some shrubby plants of the natural order *Leguminosæ*. The numerous species are widely distributed in the tropical and temperate zones, in the former of which some of the tall growing straight-stemmed species yield a textile fibre. The most important of these species are *C. juncea*, which yields the Sunn hemp of India, and *C. tenuifolia*, by some botanists considered a variety of the preceding species, which yields Jubblepore hemp. These plants are grown thickly in order to produce attenuated stems with long strands of fibre. If sown thinly they branch freely. Several American species are reputed to cause trouble (crotalism) to horses which eat them too freely. A few species are cultivated for ornament both out of doors and in greenhouses. The most popular outdoor species is probably *C. retusa*, a hardy annual herb about one and a half feet tall and bearing racemes of yellow and purple rather fragrant flowers during summer.

Crotalidæ, krō-tăl'ĭ-dē (Gr. "rattle-like"), a family of venomous serpents of the group *Solenoglypha*, and considered by Prof. Cope to be most specialized in respect to their poison apparatus of all snakes. In the *Solenoglypha* the maxillary bone is very short, and so articulated that when the mouth is opened as the snake strikes, the venom fangs are erected; otherwise they are depressed. No other teeth than the functional and prospective poison fangs are borne on the maxillary bone. This family is distinguished from the *Viperidæ* (q.v.) to which it is most closely related by the presence of a deep sensory pit before each eye, on which account the name of pit-vipers is often given to them. With the exception of a couple of Indian and Malayan species closely related to the West Indian fer-de-lance, all of the 60 or 70 species are American. Besides the numerous South and Central American species of the genus *Lachesis* allied to the fer-de-lance the family includes the copperheads, water-moccasins and rattlesnakes of the United States (qq.v.). Consult: Cope, 'Scaled Reptiles of North America,' Rep. U. S. Nat. Mus. (1898).

Crotch, William, English musical composer: b. Norwich 5 July 1775; d. Taunton, England, 29 Dec. 1847. As a child he showed astonishing precocity, and at the age of 22 was appointed professor of music at Oxford University, with the degree of doctor of music. In 1822 he became principal of the Royal Academy of Music. He left a large number of compositions, more especially for the organ, piano, and voice, and technical treatises. Among his works may be mentioned: 'Palestine,' an oratorio (1812); 'Elements of Musical Composition' (1812); 'Specimens of Various Styles of Music' (1813); and 'Captivity of Judah,' an oratorio (1834).

Cro'ton, the popular name of the genus *Codiæum* and the botanical name of another genus of the natural order *Euphorbiaceæ*. The former genus consists of about half a dozen shrubs or trees with monœcious flowers in long, slender axillary racemes, and thick leaves resembling those of the aucuba. These few species have given rise to a very large number of varieties of the most diversely colored foliage and of great variety of form. They are natives of the Malay peninsula, but are popular throughout the civilized world as ornamental plants grown out of doors in warm climates, and in greenhouses in cool countries, where they are planted in beds in parks and gardens during the summer. They must be removed to the greenhouse at the approach of frost. They are easily propogated from cuttings, easily cultivated in ordinarily good soil, and in rather high temperatures, but demand abundant light, and frequent syringing with insecticides to destroy the mealy-bug. More than a hundred varieties are cultivated in American greenhouses.

The genus *Croton* consists of about 500 species of widely distributed trees, shrubs, and herbs sometimes dioecious but usually monœcious, the flowers generally being in terminal racemes or spikes. The few American species, which are nearly all annual herbs, have attracted little attention. Many of the species are very acrid, some are fragrant, aromatic, or balsamic. *C. gratissimus* furnishes a cosmetic and perfume which is popular in South Africa; *C. flavens*, a West Indian species, also yields a perfume. Several species have been used in medicine, among the best-known being *C. eleuteria*, which yields copalche bark, and *C. tiglium*, from the seeds of which croton oil is expressed, an oil which was formerly used as a purgative, but has lost its popularity to a very large degree. This last species is a small Asiatic tree with pointed egg-shaped leaves showing various lus-

trous tints of green, bronze, and orange for which it is planted for ornamental purposes in California.

Croton Aqueduct and Croton Dam, an aqueduct and dam connected with the water supply of the city of New York. The waters of Croton Lake, an artificial body of water formed by damming the Croton River, were first conveyed to the city in 1842, by what is known as the old aqueduct, and a new aqueduct was opened in 1890. (For dimensions of these conduits, see AQUEDUCTS.) The new aqueduct passes in its lower course under Manhattan Island and rises at 135th Street, where a gate-house is constructed from which the water is distributed by means of iron pipes. Throughout its entire length this great tunnel was blasted out of solid rock, with the exception of three or four spots where "blow-offs" were constructed with the object of rapidly emptying the aqueduct — which here meets the surface — for the purpose of examination, repair, or cleansing. The tunnel is lined throughout with brick, and in one or two places where the rock has been found imperfect and a leakage is possible, iron has been added as a lining.

As early as 1881 the question arose of providing a large water-supply for the future needs of the city, and a new dam across the Croton River was ultimately decided on, the contract for the structure being awarded 26 Aug. 1892, the work to be completed 1 July 1899. In 1901 the dam was but partially completed and a modification of the design at that time involved considerable delay. The estimated cost was $5,000,000, but was increased by the change of plan, and the total expense must include the value of the condemned land (about 7,000 acres) ultimately to be flooded, and the cost, estimated at over $1,000,000, of the new roads and suspension bridges required and to be built at the city's expense. The dam crosses the valley about three and a fourth miles above the mouth of the Croton. The first step in its construction was the making of a canal 1,000 feet long and about 200 wide to turn aside the river. The foundation pit for the dam was finished in September 1897, involving the removal of 1,000,000 cubic yards of earth and rock. The dam is 700 feet long and 294 feet high, the width at the base being 200 feet, from which the structure tapers to 20 feet at the top. Across the top is a space 20 feet wide, where a public drive will be constructed. At the north end of the dam is a spillway or overflow, 1,000 feet long, leading to the river-bed below. At the southern end the masonry of the old aqueduct runs through the dam. The amount of stone and materials used is estimated at 1,200,000 tons. Up to 1903 there was expended on the structure more than 2,000,000 days of labor performed by an average of 600 men employed nearly every working day in 10 years. This great mass of masonry forms the largest and most expensive dam ever constructed on this continent and its height exceeds that of any similar structure in the world. The steam and machinery equipment has equaled that of an ordinary railroad, for besides the many hoists and derricks, there are in use several miles of tracks and 50 locomotives and cars of the dinky type used in hauling earth and stone. The new dam will increase the storage capacity of the city water supply by 32,000,000,000 gallons, nearly doubling it. The present storage capacity in the Croton watershed is given as 43,000,000,000 gallons, so that the new dam will increase the capacity to a round 75,000,000,000. The reservoir formed by the dam will make a sheet of water 19⅔ miles long. The old Croton reservoir and dam lie in the tract to be overflowed. The intake from the large new reservoir will be from the upper gate-house, where there are 22 gates each supplied with charcoal-filters through which the water must pass before it is turned into the aqueducts. These intakes have a capacity of 400,000,000 gallons a day.

Croton Bug. See COCKROACH.

Croton Oil, a fixed oil expressed from the seed of *Croton Tiglium.* (See CROTON.) The seeds have been used in medicine for a great many years. The oil is a thick, viscid, pale yellowish or brownish-yellow liquid, having a slight fatty odor and an acrid burning taste. Its solubility is like that of similar fixed oils. Its composition is extremely complex, but the active principle is chiefly a glyceride of crotonoleic acid; this makes it an extremely powerful irritant, and administered to the skin it causes vesication and pustulation. Given internally it is a very active, drastic purgative and is used practically only in obstinate cases of constipation and in the insane, who refuse to take internal medication. It should be administered very sparingly, as five drops have been known to cause severe poisoning.

Croton River, a river in New York which rises in Dutchess County, runs south through Putnam County and southwest through Westchester County, emptying into the Hudson 32 miles north of New York. Its length is nearly 60 miles. It supplies the city with water through the Croton aqueduct (q.v.). The area of the Croton watershed is about 362 square miles and in this tract the city has many millions invested. Along the course of the river the following reservoirs are situated: the Boyd's Corners, the Middle Branch, the East Branch, the Titicus, the Carmel, and the new Croton. See CROTON AQUEDUCT.

Croto'na, Italy, a Greek republic in Magna Græcia or South Italy, founded about 700 B.C. Livy gives the circumference of the city of Crotona at 12 miles. This city was famous for producing the strongest athletes, among them the celebrated Milo. It is still more celebrated as the city where Pythagoras settled between 540 and 530 B.C., and where he taught. Milo was one of his disciples. Under the Romans Crotona was notorious for its luxury and dissoluteness. Crotona is the modern Cotrone, and the ruins of the ancient town are still to be seen above Capo della Colonna.

Crotophaga, krō-tŏf'a-ga, a genus of birds, the typical one of the sub-family *Crotophaginæ.* The bill is greatly compressed, and the ridge of the upper mandible keeled. The species are found in South America. *C. ani* is the ani or anno so called by the Latin races of South America, the razor-billed blackbird of Jamaica, called also the savannah bird and the great blackbird. It feeds on small lizards, insects, and seeds. It lives in flocks, and when one individual is slain the rest gather again

almost at the same spot. Several females are said to use the same nest.

Crouch, Frederick William Nicholls, American composer, b. London, England, 31 July 1808; d. Portland, Me., 19 Aug. 1896. He began his professional career at the age of nine at the Royal Coburg Theatre; became a violoncellist in the Drury Lane Theatre orchestra, and a member of the queen's private orchestra. In 1849 he came to the United States, played, taught music, lectured, and directed musical organizations in New York, Boston, Portland, Me., Washington, and Richmond, Va. During the Civil War he served in the Richmond Grays. His most famous composition is: 'Kathleen Mavourneen,' and others are: 'O'Donnel's Farewell,' and 'The Emigrant's Lament.' Cora Pearl, a Paris celebrity in the time of Napoleon III., was his eldest daughter.

Croup, a term of popular rather than of scientific significance, usually applied to any hard, harsh, discordant cough which may or may not be attended with difficulty in breathing. There are, however, two distinct and well-marked diseases that are commonly found in children to which this term has been widely applied. One, the commoner, is a form of mild inflammation of the vocal cords, a catarrhal laryngitis, and is popularly called false croup. The other, termed membranous croup, is a diphtheria of the larynx and adjacent parts. The term croup is, therefore, one best avoided. There are a number of other conditions less common than the one just named that give rise to a harsh, croupy cough. One of the most characteristic is a nervous affection of the vocal cords known as laryngismus stridulous.

In acute catarrhal laryngitis which affects chiefly young children following an exposure to wet or cold, the child without previous warning awakens at night and commences to cough. This cough is extremely harsh, prolonged, and paroxysmal and in the effort to get breath cold perspiration breaks out on the child's body, and in severe cases it often seems as though the child would choke to death, the inspirations being long and hissing and the expirations short, harsh, and difficult. The child becomes blue and almost convulsed. These attacks may last from half an hour to four or five hours, and then, sometimes without treatment, disappear as suddenly as they have come, and during the day the child is about, and apparently as well as ever. As a rule there is but little rise in temperature, and there are no signs of swelling of the throat, or of grave constitutional disturbances such as are found in diphtheria. In these mild cases of laryngitis a recurrence of the affection is to be expected and unless proper treatment is instituted throughout the day, nightly attacks of coughing may persist for a week or two. It is noticeable that this affection is found usually in many children of the same family and in those whose parents have been prone when children to have similar attacks, thus pointing to nervous factors as hereditary in its causation.

The treatment is comparatively simple, yet it is very important that a regular practitioner should be called in order to determine the exact diagnosis, for if severe disease, such as diphtheria, is mistaken for an acute spasmodic laryngitis of this type a fatal result may ensue. One of the very best modes of treatment for this affection is for the patient to breathe steam. This may be generated by means of an ordinary croup kettle and led beneath a sheet arranged like a tent over the crib or bed or, if the child is older and intelligent enough, a large water pitcher may be half filled with boiling water and the steam may be breathed at the mouth of the pitcher, a towel being thrown over the mouth of the child. Very frequently the mother or nurse by placing her own head beneath the towel at the same time, can reassure the child, if there is any struggling by reason of fear. The air of the room should be kept moist by means of steam and some quieting medicine may be given the child, one of the very best being minute doses of bromide or of codeine. Frequently an emetic is of service.

In diphtheria the disease is much more grave. Here one has to do with an acute infectious disease due to a specific bacterium, the *Bacillus diphtheriæ* that develops a very highly toxic poison. Very frequently the effects of the intoxication of the diphtheria bacillus are out of all proportion to the amount of membrane that may be developed in the child's throat and larynx, so that the amount of local swelling, which is nearly always present, and a high temperature, are not necessarily true criteria of the severity of this affection. For a full consideration of the symptoms and treatment of diphtheria of the larynx see the article on DIPHTHERIA. See also LARYNGISMUS STRIDULUS; NOSE AND THROAT.

Crousaz, Jean Pierre de, zhŏñ pē-ār dė kroo-zä, Swiss mathematician and philosopher: b. Lausanne, 13 April 1663; d. 22 March 1748. In 1682 he went to the University of Leyden, and on returning to his native town was ordained minister, appointed honorary professor, and remained pastor of the church at Lausanne. Here also he taught mathematics and philosophy, and in 1724 was appointed professor of the same subjects at the University at Groningen. The principal of his works are: a 'New Essay on Logic'; 'Summa Logica' (1724); a 'Treatise on Education'; 'Examination of Ancient and Modern Pyrrhonism'; 'Geometry of Lines and Surfaces.'

Crow Indians or Crows, or Absoruque or Asaroka, a tribe of the Hidatsa division of the North American Indians. They are named after a species of hawk, not after the bird commonly called the crow. They belong to the linguistic stock included under the name Siouan Indians and are of the same family as the Dakotas. It was common for them to be engaged at war with other tribes of the same family.

When the explorers Lewis and Clark visited the Crows, they found the tribe divided into four groups or "bands." Brown located them on the Yellowstone River in 1817, and in 1842 they were reported by the government agents as inhabiting the land around the head waters of the Yellowstone. They were then 4,000 in number. Later they were removed to a reservation in Montana. Pop. 2,287.

Crow. The crow family (*Corvidæ*), order *Passeres*, comprises birds that have a strong bill, compressed toward the points, and covered at the base with stiff, bristly feathers, which

advance so far as to conceal the nostrils. The plumage is dense, soft, and lustrous, generally dark, but sometimes of gay colors. They are very omnivorous, and remarkable for their intelligence. The family, widely diffused over the world, includes the common crow, type of the *Corvidæ;* and the raven, the fish crow, the rook, the jay, and the magpie. The common crow of North America, *Corvus americanus* (Audubon), is about 20 inches long, and the wings about 13 inches. It is remarkable for its gregarious and predatory habits. The bill is straight, convex, and compressed. The nostrils are placed at the base of the bill, and are pantalous; the tongue short, and bifid at the tip; the toes are separated almost to the base, and the middle one is the longest; the wings sub-elongated and acute, and the tail composed of 12 feathers. They pair in March; the old repair their nests, the young frame new ones; but they are such thieves that while the one is fetching materials the other must keep watch to prevent the rising fabric from being plundered by their neighbors. As soon as the nest is finished and the eggs produced (five, bluish green, with dark blotches), the male takes upon himself the care of providing for his mate, which he continues during the whole period of incubation. They frequent the same rookeries for years, but allow no intruders into their community. They are omnivorous and feed largely upon insects and small animals of all kinds, as well as on grain and seeds, whence they have sometimes been supposed injurious to the farmer; but they amply repay him for what they take by destroying the vermin in his fields. The fish crow (*Corvus ossifragus*) is a closely similar but somewhat smaller species, chiefly maritime in the eastern United States, but found for a considerable distance along river valleys. Less social than the common crow, it often associates with that bird, so that it is very commonly overlooked. In England the name is applied to the rook and other species. In India there is a hooded crow, also of the genus *Corvus.*

Crow-blackbird, the name of certain American birds of the genus *Quiscalus,* family *Icteridæ* or hang-nests. The great crow-blackbird, or grackle, *Q. major,* found in the Southern States, Mexico, and the West Indies, is 16 inches long, and of a glossy black plumage. The female is of a light brown above and whitish beneath. The purple grackle, lesser or common crow-blackbird, *Q. versicolor,* is similar in color to the preceding, but smaller. They reach the Middle States of the United States from the South in flocks in the latter part of March, and build in April in swamp-bushes and trees. In their first arrival they feed upon insects, but afterward commit great ravages upon the young corn. In November they fly south again.

Crowberry, or **Crakeberry** (*Empetrum*), a genus of low-growing evergreen shrubs of the natural order *Empetraceæ.* The few species are characterized by small, crowded, evergreen leaves, inconspicuous blossoms and globular, usually black, edible berries, with 6 to 10 bony seeds in a slightly acid, very juicy pulp. They are natives of cold, northern climates (one in South America), and are sometimes used for making a fermented beverage. As dessert fruit they have little value, but they are eaten in northern Europe, where they are regarded as a scorbutic and diuretic. Crows are especially fond of them; hence the name. The plants are often used for ornament in rookeries where the soil is moist and peaty or sandy.

Crowe, Catherine Ann Stevens, English author: b. Borough Green, Kent, about 1800; d. 1876. She made her first essay in literature with a tragedy, 'Aristodemus,' and then turned to prose fiction. 'Lily Dawson' (1847) is regarded as the best of her novels. She became an ardent devotee of spiritualism and animal magnetism, and in 1852 published her most notable work, 'The Night Side of Nature.'

Crowe, Eyre, English historical and genre painter: b. London 3 Oct. 1824. He studied painting in the atelier of Paul Delaroche in Paris, and went with that artist to Rome in 1844. Acting as amanuensis to William M. Thackeray, he visited the United States in 1852–3. He was elected an associate of the Royal Academy in 1876. Among his paintings are: 'Goldsmith's Mourners' (1863); 'Blue Coat Subjects' (1872); 'French Savants in Egypt' (1875); 'The Rehearsal' (1876); 'Sanctuary'; 'Prayer'; and 'Bridal Procession at St. Maclou, Rouen' (1877); 'School Treat' (1878); 'Blue Coat Boys Returning from Their Holiday'; 'Marat: 13 July 1793'; 'The Queen of the May' (1879); 'Queen Eleanor's Tomb' and 'Forfeits' in 1880; 'Sandwiches' and 'Sir Roger de Coverley and the Spectator at Westminster Abbey' (1881); 'How Happy Could I Be with Either!' and 'The Defense of London in 1643,' exhibited in 1882; 'Old Porch, Evesham' (1884). He published 'With Thackeray in America' (1893).

Crowe, Sir Joseph Archer, English historian of art and miscellaneous writer: b. London 20 Oct. 1825; d. Bavaria 7 Sept. 1896. He was long eminent as a journalist, and for a time served in the British diplomatic service. His celebrity rests mainly on the 'History of Painting in Italy' (1864–71), the most important work on this subject, written in collaboration with G. B. Cavalcaselle (q.v.). He also published other volumes on art subjects.

Crowe, William, English clergyman and poet: b. Midgham, Berkshire, 1745; d. Bath, Somerset, 9 Feb. 1829. He was the author of 'Lewesdon Hill,' a descriptive poem, praised by Wordsworth, Coleridge, and Moore (1788); 'Treatise on English Versification' (1827); etc.

Crowell, Edward Payson, American educator: b. Essex, Mass., 1830. He was graduated at Amherst College 1853; was tutor there 1855–6; professor of German 1858–64; and of the Latin language and literature 1858 to the present time. He has edited 'Selections from the Latin Poets, Catullus, Tibullus, Propertius, etc.' (1882), and with Richardson, translated Herman Bender's 'Brief History of Roman Literature' (1880).

Crowell, John Franklin, American author: b. York, Pa., 1 Nov. 1857. He was graduated at Yale 1883; was president of Trinity College, North Carolina, 1887–93; and professor of sociology and economics at Smith College, Northampton, Mass., 1895–7. He became an expert agent for the United States Industrial Commission, and since August 1900 has been expert on internal commerce in the Treasury

Bureau of Statistics, Washington, D. C. He has published: 'Taxation in the American Colonies'; 'The Logical Process of Social Development'; and many contributions to the 'Monthly Summary of Commerce and Finance of the United States' (1900–3).

Crowest, Frederick J., English writer, manager, and editor of the Walter Scott Publishing Company; b. London 30 Nov. 1850. He was carefully trained in music and singing, and was for some years in the editorial employ of Cassell, Petter & Galpin, publishers. He has written: 'The Great Tone Poets' (1874); 'Book of Musical Anecdote' (1877); 'Advice to Singers' (1878); 'Phases of Musical England' (1881); 'Cherubini' (1890); 'Musical Groundwork' (1890); 'Dictionary of British Musicians' (1895); 'The Story of British Music' (1895); 'Verdi: Man and Musician' (1897); 'Beethoven' (1899); 'The Story of Music' (1902).

Crowfield, Christopher, a pseudonym sometimes used by Harriet Beecher Stowe.

Crowfoot, or **Buttercup**, common names of the genus *Ranunculus*, the typical genus of the natural order *Ranunculaceæ* or crowfoot family. The genus has over 200 species, widely distributed in the temperate regions of the world, and on the mountain-tops of the tropics. The plants of the genus are both aquatic and terrestrial, and are generally classed as useless weeds. The name buttercup is popularly applied in the United States to the species with large flowers and divided leaves. The buttercup is called "crazy" by the rustics of central England, who believe that its smell will cause madness.

Crowland, or **Croyland**, England, a town in the county of Lincoln, eight miles north of Peterborough; pop. (1891) 2,800. It consists of four principal streets, at the intersection of which is a very curious ancient triangular bridge. On one of the wings of this is a dilapidated statue, attributed to the 9th century, and supposed to be that either of Alfred or Ethelbald, king of Mercia. The only other remarkable edifice is the ruined abbey of Crowland, the north aisle of which forms the parish church. Ingulphus, to whom a history of the Abbey of Crowland, first published at London in 1596, afterward at Oxford in 1684, has erroneously been attributed, was abbot of Crowland from 1075 till 1109.

Crowley, La., a town and county-seat of Acadia, on the Southern Pacific R. R., about 142 miles northwest of New Orleans, and 45 miles from the Gulf. It is the centre of a rice district, and nearby are oil fields. Rice-milling is the principal industry. The electric plant and waterworks are owned by the town. Pop. 4,392.

Crown. 1. In the early ages, a wreath of flowers or leaves was one of the first emblems of honor or of joy. Such was the ornament of the priest in the performance of sacrifice, of the hero on his return from victory, of the bride at her nuptials, and of the guests at a feast. The ancient mythology, which gave everything a distinct beginning and a poetical origin, ascribes the invention of wreaths to Prometheus, who imitated with flowers the fetters which he had borne for his love to mankind, whom he had created. According to Pliny, wreaths were first made of ivy, and Bacchus first wore them. In process of time they were made of very various materials. Those worn by the Greeks at feasts in honor of a divinity were made of the plant consecrated to the god. Wreaths of roses afterward became very common. In some cases wreaths were even made of wool. Wreaths of ivy and parsley were worn by the Greeks on the head, neck, and breast at entertainments, with a view to prevent drunkenness. Mnesitheus and Callimachus, two Greek physicians, wrote entire books on wreaths, and their medical virtues. Corpses were covered with wreaths and green branches. Lovers adorned with wreaths and flowers the doors of their mistresses, and even captives who were to be sold as slaves wore wreaths, hence the phrase, "sub corona venire or vendere." The beasts sacrificed to the gods were also crowned. Wreaths, in process of time, were made of metal, in imitation of flowers, or of the fillet which the priest wore round his head when he sacrificed, which was called diadema. This attribute of distinction was early adopted by the kings, when they united in their persons the temporal and spiritual power. Among the various crowns and wreaths in use among the Greeks and Romans were the following:

Corona agonothetarum, the reward of the victor in the great gymnastic games. The wreaths conferred at the great games of Greece were of different kinds; at the Olympic games, of wild olive; at the Pythian games, of laurel; at the Nemean games, first of olive branches, then of green parsley; at the Isthmian games, a wreath of pine leaves, afterward of ivy; subsequently pine leaves were resumed.

Corona aurea (the golden crown), the reward of remarkable bravery.

Corona castrensis, given to him who first entered the camp of the enemy.

Corona civica, the second in honor of the crowns bestowed by the Romans for military achievements. It was given to him who had saved the life of a Roman citizen in battle.

Corona convivialis, a wreath worn at feasts.

Corona muralis, given by the general to the soldier, who first scaled the enemy's wall. It was made of gold, and embattled above.

Corona natalitia, a wreath which parents at Athens and Rome hung up before the door at the birth of a child. At Athens it was made of olive branches if the child was a boy, and of wool if a girl.

Corona navalis, the next in rank after the civic crown, was given to him who first boarded and took an enemy's vessel. Like the corona muralis it was made of gold. It is not known whether the corona rostrata was the same with this one, or one which conferred a still higher honor.

Corona nuptialis, a crown or wreath worn by brides. The bridegroom also, and his relations, on the day of his wedding, adorned themselves with wreaths. At first the corona nuptialis was of flowers plucked by the bride herself; afterward of gold or silver and precious stones.

Corona obsidionalis, a reward given to him who delivered a besieged town or a blockaded army. It was the highest military honor among the Romans, and the most difficult to be obtained. It was made of grass, or weeds, and flowers; if possible, of such as grew on the delivered place.

Corona triumphalis, a wreath of laurel which was given by the army to the imperator. He wore it on his head at the celebration of his triumph. Another crown, made of gold, which was also presented by the army to a general holding a triumph, being too massive to be worn, was carried over the head of the general during his triumph. A third crown (also a golden one, and of great value) was received by the general from the provinces.

In the Middle Ages crowns became exclusively appropriated to the royal and imperial dignity; the coronets of nobles were only borne in their coats of arms. It is, however, with the eastern diadem rather than with the classic corona that the crown as a symbol of royalty is connected; indeed, it was only introduced as such a symbol by Alexander the Great, who followed the Persian usage. The English crown has been gradually built up from the plain circlet with four trefoil heads worn by William the Conqueror. This form was elaborated and jeweled, and finally arched in with jeweled bands surmounted by the cross and sceptre. As at present existing the crown of England is a gold circle, adorned with pearls and precious stones, and bearing alternately four Maltese crosses and four fleurs-de-lis. From the top of the crosses rise imperial arches, closing under a mound and cross. The whole covers a crimson velvet cap with an ermine border. The Scottish crown consists of a jeweled and enameled circle of gold, supporting 10 fleurs-de-lis and 10 crosses fleury in alternation. Each of the crosses is adorned with a diamond and pearls, and from them rise four gold arches, closing under a mound, which bears a pearl-bedecked cross pattée. The royal crown of France is a circle ornamented with eight fleurs-de-lis, from which rise as many quarter-circles closing under a double fleur-de-lis. The Austrian crown is a sort of cleft tiara.

2. The term crown is used figuratively for the royal power, in contradistinction either to the person of the monarch or to the body of the nation, with its representatives, interests, etc. Thus, in modern times, the word crown is used to express the rights and prerogatives of the monarch considered as a part of the state, which includes all powers — the legislative, judicial, etc. Thus the crown domains are distinguished from the state or national domains.

3. In architecture, crown denotes the uppermost member of a cornice; the corona; also a sort of ornamental structure surmounting a tower and formed by flying buttresses meeting together at top.

4. In English money, the crown is a coin, worth five shillings, or $1.22.

Crown-gall, a disease of many fruit and forest trees caused by a myxomycete fungus, *Dendrophagus globosus,* which obtains entrance usually at the juncture of the roots and the trunk (the crown), but sometimes appears upon the roots. In young trees the galls are often half an inch in diameter, colored like the roots or darker, soft and composed of apparently unorganized tissue, but in old trees they frequently show concentric rings and may become several inches in diameter. In Europe, America, and New Zealand, where this disease is known, considerable damage has been reported, even whole orchards being destroyed by the fungus. The only remedy thought to be of service is the annual removal of the galls and the covering of the wounds with thickened Bordeaux mixture.

Crown Glass, very hard and clear, made almost entirely of sand and alkali and a little lime, without lead or any metallic oxide except a very small quantity of manganese, and sometimes of cobalt. Crown glass is used in connection with flint-glass for optical instruments, in order to destroy the disagreeable effect of the aberration of colors. This important discovery by Dollond, who turned it to admirable account in the achromatic telescope, was carried to the highest perfection by Reichenbach. This glass is much used for windows.

Crown Lands, in American history. The British sovereign was formerly in theory the owner of all waste lands of the kingdom. After the downfall of the French power in Canada, the English government, to quiet the fears of the Indian tribes that their lands were to be gradually taken away, reserved all lands west of the colonies up to the Spanish line as "crown lands," for the use of the Indians. No purchases or settlements were to be made in this territory without permission from the royal government; but this conflicted seemingly with the bounty provisions (see Bounty Lands), and in fact vast tracts were taken up in hope of future validation. These lands formed the claims which were ceded to the general government by the States when the Union was formed. See Territories.

Crown Point, Ind., the county-seat of Lake County, in the northwestern corner of the State, on the Erie and the Pittsburg, C., C. & St. L. R.R.'s., about 40 miles southeast from Chicago and 15 miles south of Lake Michigan. The town has grain elevators, iron-works and a shirt factory. Pop. (1900) 2,336.

Crown Point, N. Y., a town in Essex County, on Lake Champlain, and on the Delaware & H. R. R.R., about 30 miles northwest of Whitehall. This town is noted because of its being the scene of some of the minor contests of the Revolutionary War. It was in possession of the French at one time, later the English took possession and in 1775 the Americans, under Seth Warner, gained control; but in 1777 it was abandoned by the Americans at the approach of Gen. Burgoyne. For some years the chief industry was mining iron ore, but since that has been given up the town has lost some of its population. The town now is dependent upon the trade in the agricultural products of the surrounding country. Pop. (1900) 2,112.

Crown Point, Fortress of. Lake Champlain being the one open highway between French and English North America, its control was of vital importance when the struggle for mastery arose. The chief ground of vantage was the place where the lake suddenly narrows to the width of a river, so that a few cannon would command the passage. This was called Pointe à la Chevelure (Scalp Point) by the French, Crown Point by the English. In 1726 the French established a post opposite, on the east side of the lake; they withdrew in fear of Massachusetts, but that colony fell to quarreling with New Hampshire, and New York (which claimed the point) with New Jer-

sey. In 1631, on a false rumor that the English (whose colonies lacked both unity and foresight for such a purpose) were about to fortify the point, the governor of Canada sent workmen and troops under Sieur de la Fresnière to build a fort there, which was called Fort Frederic, and had a heavy stone tower mounted with cannon to sweep the narrow lake. This advance of the French power into the very lands of the colonies was a defiance, if not an act of war; but it took nearly a quarter of a century more to join battle. In 1755, at the opening of the final contest, an expedition against Fort Frédéric was planned by Gov. Shirley of Massachusetts, and led forward by Sir William Johnson; but it got no farther than Fort Edward, and ended in the bloody drawn battle of Lake George (q.v.). In 1756 the French built Ticonderoga farther down, on the isthmus between Lake Champlain and Lake George; this left Crown Point a second instead of first line of defense, but the two were the chief French frontier posts through the war. In 1756 an expedition from Albany against them was undertaken, but came to nothing; in 1757 Major Robert Rogers' rangers raided around them. In 1759 they were captured by Amherst, Crown Point being abandoned as soon as Ticonderoga was taken. Both posts were kept up by the British, and at the outbreak of the Revolutionary War were the first thought of the colonists, to open the route to Canada and seize the stores they contained. On 10 May, while Arnold and Ethan Allen took Ticonderoga, Seth Warner captured Crown Point, with over 200 cannon and a quantity of ammunition. The present village of Crown Point is several miles below the point and the old fort.

Crown'inshield, Arent Schuyler, American naval officer: b. New York State 1843. He was graduated at the United States Naval Academy in 1863, and participated in both attacks on Fort Fisher in the Civil War. Later he rose through the grades to the rank of captain. During the war with Spain in 1898 he was a member of the board of strategy. In 1900 he was chief of the bureau of navigation, with the rank of rear-admiral, and in 1902 became commander of the European squadron.

Crowninshield, Frederic, American artist: b. Boston, Mass., 27 Nov. 1845. He was graduated at Harvard 1866; spent 11 years in Europe studying art under Rowbotham, Couture, and Cabanel, his first exhibited work appearing in the Paris Salon of 1878. He was instructor in the Boston Museum of Fine Arts 1879–85, since when he has devoted himself largely to mural painting and stained glass work. His water colors are greatly admired and sought for by collectors. He has published: 'Pictoris Carmina, a Painter's Songs' (1900), illustrated by himself, 'A Painter's Moods' (1903).

Crowninshield, Mary Bradford, American novelist and writer for young people: b. Maine 1854. She is a descendant in the 10th generation of Gov. William Bradford of Plymouth Colony, and wife of A. S. Crowninshield (q.v.). She has published over the signature "Mrs. Schuyler Crowninshield": 'All Among the Light Houses' (1886); 'Light-house Children Abroad' (1889); 'Latitude 19°: a Romance of the West Indies' (1898); 'Where the Trade Wind Blows' (1898); 'Plucky Smalls'; 'San Isidro' (1899); 'The Archbishop and the Lady' (1900); 'Valencia's Garden' (1901).

Crowther, krō'ther, **Samuel Adjai,** Anglican bishop: b. Ochegu, east of the kingdom of Dahomey, 1812; d. Africa 31 Dec. 1891. He was the first negro bishop of the Church of England. He was carried into slavery in 1821, but was freed, with a large company of his countrymen, by a British man-of-war in 1822, and landed at Sierra Leone, where he soon became an excellent scholar. He finished his education in England, where he took orders in the English Church in 1843, and accompanied the first and second Niger expeditions, publishing a narrative of the latter. In 1864 he was ordained Bishop of the Niger, and filled that place with honor. He published several books in and on the Niger languages and ranks high among African linguists.

Croydon, England, a municipal and parliamentary borough in county Surrey, 10 miles south of London, of which it is practically a suburb; near the sources of the Wandle, and not far from the Banstead Downs; on the London and Brighton R.R. It is a place of ancient origin, but from its recent rapid increase is almost entirely new. Of special interest are the remains of the ancient palace, long a residence of the archbishops of Canterbury. Pop. (1901) 133,885.

Crozat, Joseph Antoine, zhō'zĕf äñ twäñ krō-zä, Marquis Duchâtel, French art collector: b. Toulouse 1666; d. 1740. The sketches in his collection exceeded 19,000, and he had expended above 450,000 livres in this particular branch. During the 60 years which he employed in collecting, no cabinet was sold in Europe of which some part was not purchased by him. On Crozat's death, his collection came into the possession of his brother, the Marquis Duchâtel, after whose death most of the articles of virtu were dispersed. The greater part of the picture gallery passed to Crozat's nephew, Baron Thiers, from whose heirs it was purchased by the empress of Russia. Consult Mariette, 'Description sommaire des Collections de M. Crozat' (1741).

Crozet Islands, a group of four, in the southern portion of the Indian Ocean, between Kerguelen and Prince Edward islands. They are all of volcanic origin, and the most easterly of them, called East Island, has precipitous cliffs on the coast, and in the interior lofty peaks, exceeding 4,000 feet. The largest, called Possession Island, visited by the Challenger expedition in 1873–4, is believed to be about 20 miles long by 10 broad.

Crozier, krō'zhėr, **John Beattie,** English philosophical writer: b. Galt, Ontario, 23 April 1849. He was educated at Toronto University, and in 1872 began the practice of medicine in London. He has written: 'God or Force'; 'Religion of the Future' (1880); 'Civilization and Progress' (1885); 'Lord Randolph Churchill, a Study in English Democracy' (1887); 'History of Intellectual Development' (1887–1901); 'My Inner Life, Being a Chapter in Personal Evolution and Autobiography' (1898).

Crozier, William, American military officer: b. Carrollton, Ohio, 19 Feb. 1855. He was graduated at the United States Military Academy in 1876; served for three years in the

West, taking part in the campaigns against the Sioux and Bannock Indians; was instructor of mathematics at the Military Academy in 1879–84, when he entered the ordnance department; and was commissioned captain in 1890. He invented a wire-wrapped rifle and a 10-inch gun, and with Gen. Buffington, the disappearing gun carriage. He took part in the Spanish-American war; and was appointed chief of ordnance with the rank of brigadier-general in November 1901.

Crozier Theological Seminary, in the borough of Upland, near Chester, Pa. It was founded by John P. Crozier, his wife, Sallie Knowles Crozier, and his children, who jointly endowed the school with lands, buildings, and invested funds amounting to $275,000. The school was incorporated in 1867 and in 1902 had in attendance 108 students.

Crucible, a vessel used in chemistry and the arts for containing substances that are to be subjected to high temperatures. A good crucible should be capable of withstanding great and sudden changes of temperature without fracture or disintegration; it should not be attacked by the substance it is to contain; and it should be infusible at the temperatures to which it is to be exposed. Numerous materials are used in the manufacture of crucibles, each having its own peculiar advantages and disadvantages. Platinum is an ideal material for many purposes, but it is exceedingly expensive, and it cannot be used for the fusion of metals. Clay, or a mixture of clay with sand, graphite, or old broken crucibles, is a favorite material, and Hessian crucibles, composed of equal parts of clay and sand, are in very general use. Hessian crucibles are commonly triangular in shape and coarse in texture. They are porous, they fracture easily from sudden changes in temperature, and they will not withstand the action of litharge; but they are cheap, and will not fuse at any temperature that is attained in ordinary operations. The clay that is used in the manufacture of crucibles should be "weathered" for some months, by exposure to air in a moist condition, in order to effect the decomposition or elimination of certain impurities, such as pyrites, that would be prejudicial to the finished vessel. Graphite is used to a considerable extent in the manufacture of crucibles, especially for those that are to be used for melting metals. Lime crucibles, cut from blocks of well-burned lime, are practically infusible, but they will not stand exposure to air for any length of time, since they absorb moisture, becoming converted into calcium hydrate, and then disintegrating. Magnesia crucibles are also practically infusible, and are not affected by exposure to the air. A mixture of equal parts of magnesia and bauxite (q.v.) makes excellent crucibles. Alumina (oxide of aluminum) is also highly recommended as a material for crucibles, as it will withstand sudden changes of temperature quite well, is practically infusible for all ordinary purposes, and is not attacked even by melted sodium.

Cruciferæ, kroo-sĭf'ē-rē (Lat. *crux*, cross + *ferre*, to bear), a large order of dicotyledonous plants, the mustard family, consisting of herbs and a few low shrubs with pungent and stimulating but not poisonous properties. The flowers of crucifers have four deciduous sepals and four regular, hypogyrous petals arranged in such a way as to suggest the form of a cross, whence the name of the plants. Of the six stamens two are shorter than the others, and have a lower insertion. The fruit is a two-celled pod, known in its long form as a silique, in its short form as a silicle or pouch, and when articulated and separating at the joints, as a loment. The seeds are without albumen; leaves alternate and exstipulate. The characters of the genera depend upon the pods and seeds. There are about 185 genera and nearly 2,000 species of crucifers dispersed throughout the temperate regions of the globe. They are most abundant in Europe and Asia Minor. Many useful vegetables belong to this family, such as the cabbage, cauliflower, kale, Brussels sprouts, broccoli, and kohlrabi, the various kinds of turnip, and the radish. The horseradish (*Nasturtium armoracia*) has long been known as a condiment. The watercress introduced from Europe now grows wild in America. The seeds of the white mustard (*Brassica alba*) and the black mustard (*B. nigra*) are ground for use as a condiment and also for medicinal purposes. Various well-known ornamental flowers belong to the *Cruciferæ*, such as the wall-flower, the stock, the rocket candytuft, sweet alyssum, honesty, etc. The curious plant known as the rose-of-Jericho or resurrection-plant (q.v.) is also a member of this family.

Crucifix, a cross bearing the figure of Christ. It cannot be said at what time this emblem of the Christian faith began to be used, either by the Christian Church or by individual Christians. A general feeling of repugnance toward the instrument of punishment which, among the Romans, was reserved only for the most infamous class of criminals, would for a long time prevent the early Christians from representing Christ upon the cross, and this feeling would have to be conquered before the crucifix could come into use in public worship. There are certain remains which would seem to show that crucifixes existed in the beginning of the 3d century; but it is probable that all these were merely tokens of individual piety. It is certain that the most ancient crucifixes known to exist belong to this class. Such, for example, is that painted in the Syriac evangelistary of the year 582, contained in the Laurentian library at Florence; and such also is the pectoral cross of the superiors of Monza, which is said to have been a gift of Pope Gregory the Great to Theodolinda, who founded the cathedral. Crucifixes appear to have been first used in public worship toward the end of the 6th century. The most ancient example known of a crucifix used for this purpose is one which, on the testimony of St. Gregory of Tours, was painted in a church at Narbonne. For more than 100 years after this period they were still rare, and it was not till after the Trullan Council, held at Constantinople in 692, which ordained that historic painting should be preferred to emblems or symbolical figures, that the images of Christ crucified began to multiply. As to the manner of representing Christ on the cross it appears to be unquestionable that, as a rule, the figures on the most ancient crucifixes were engraved on gold, silver, or iron crosses. On the pectoral cross of Monza, however, the figures are enameled on a gold cross. At a later

period they were painted on wood, and it is only in the 9th century, in the pontificate of Leo III., that the figure of Christ appears carved upon the cross in bas-relief. Although there can be no doubt that Christ, in accordance with the Roman custom of representation, was crucified naked, all the most ancient crucifixes, almost without exception, represent him as clothed with a tunic reaching down to the feet. This practice lasted down to the 8th century, when it began to be modified, the body of Christ being no longer covered above the loins; and at length it became the custom to represent Christ, as in the crucifixes of the present day, entirely naked with the exception of a cloth about the loins. Another point in which the ancient crucifixes differ from modern ones is as to whether Christ is represented dead or alive. Until the 11th century he is represented alive; since that period he has been represented as dead. The first example of Christ being represented as dead is furnished by a manuscript in the Laurentian library at Florence, belonging to about the year 1050. In the earlier crucifixes, also, the number of nails by which Christ is fixed to the cross is four, one through each hand and each foot, while in the more modern ones there are only three nails, one foot being laid above the other and a single nail driven through both. Many crucifixes bear also the inscription put upon the cross by the order of Pilate, but this is always found in an abbreviated form, both in ancient and modern times. In the Latin Church it is frequently omitted, but the Greek Church have adhered more strictly to this practice. Various accessories are also sometimes found in crucifixes, such as figures of the sun and moon, the lamb, of the Virgin Mary, and Saint John, of the two soldiers — one presenting the vinegar for Christ to drink, the other with the lance with which he pierced the side of Christ; emblematical figures representing the four evangelists; angels in a posture of adoration, and certain saints.

Crucifixion, the manner by which Jesus Christ was put to death by the Jews (see St. Matt. xxvii.). Nailing victims to a cross was a mode of punishment frequent among the ancients, but it is now confined to the Mohammedans. Different kinds of crosses were used, as the Latin, with two beams at right angles, the St. Andrew's, made in the form of the letter X, and others. The cross was sometimes employed by the ancients as a terrible instrument of destruction to a vanquished enemy. Thus Alexander the Great, after putting 8,000 or 10,000 Tyrians to the sword, on taking their city, crucified 2,000 more along the shores. Not less sanguinary was the vengeance of the Romans against the Jews; Minutius Alexander crucified 800, and Quinctilius Varus 2,000, on account of some revolt. Titus, whom we are wont to esteem as humane and merciful, crucified above 500 in a day; and at the sack of Jerusalem, under his command, the Romans, wherever they could seize the affrighted fugitives, either in hatred or derision nailed them to crosses about the walls of the city, until the multitude was so great that room was wanting for the crosses, and crosses for the bodies.

Cruden, kroo'dĕn, **Alexander,** Scottish biblical scholar: b. Aberdeen 31 May 1700; d. London 1 Nov. 1770. In 1722 he went to London, where he was employed as tutor in several families. Previous to 1732 he opened a bookseller's shop under the Royal Exchange, and in 1735 was appointed bookseller to Queen Caroline. His great work appeared in 1737, under the title of 'A Complete Concordance of the Holy Scriptures of the Old and New Testament.' In a pecuniary point of view it was not at first successful, and the embarrassments to which it reduced the author caused a return of a mental malady, which occasioned his being sent by his friends to a lunatic asylum. After his release he instituted an action of damages against those who had confined him, and published an account of his confinement under a whimsical title. In 1753 he was again placed in confinement, and again, on being liberated, published an account of his case. Of Cruden's great work, the Concordance, three editions appeared during his life. The pains which he took with it were prodigious, constructing it anew from the foundation, without availing himself of the labors of his predecessors, and verifying personally the accuracy of each quotation and reference. He was also the author of 'A Scripture Dictionary, or Guide to the Holy Scriptures'; and 'The History and Excellency of the Scriptures.'

Cruger, kroo'gĕr, **Julia Grinnell Storrow** ("Julien Gordon"), American novelist: b. Paris, France. She has written: 'A Wedding and Other Stories'; 'A Diplomat's Diary'; 'Mademoiselle Réséda'; 'A Puritan Pagan'; 'Marionettes'; 'A Successful Man'; 'Vampires'; 'Poppæa'; etc.

Cruger, Mary, American writer: b. Oscawana, N. Y., 9 May 1834. She was a contributor to the 'Standard Dictionary,' and has written: 'Hyperæsthesia, a Novel' (1885); 'A Den of Thieves: or, the Lay Reader of St. Mark's' (1886); 'The Vanderheyde Manor-House' (1887); 'How She Did It: or, Comfort on $150 a Year' (1888); 'Brotherhood' (1891).

Cruikshank, krŭk shănk, **George,** English illustrator and caricaturist: b. London 27 Sept. 1792; d. 1 Feb. 1878. Family necessities compelled him, when still a child, to produce what he could, and the want of careful preliminary study at his outset in art affected his productions through a great part of his career. Hence his defects were chiefly those of taste, and these have operated to his being popularly ranked somewhat lower as an artist than his merits deserve. For his drawing was always faithful, precise, and felicitous, his facility amazing, and his invention inexhaustible. The catalogue of his productions prepared by the keeper of the prints in the British Museum comprises 5,500 articles, many of them recalling Rembrandt's work by their richness in light and shade. The earliest of his drawings known is dated 1799, when he was only seven years of age, and when 15 he was comparatively distinguished. His first occupation was designing illustrations for children's books and popular songs. In 1837 Cruikshank commenced in 'Bentley's Miscellany' his famous series of etchings on steel illustrative of Dickens' 'Oliver Twist,' full of pathos, humor, and tragic power. Having connected himself with the temperance movement he produced the 'Bottle,' a powerful series of designs, characterized, from its subject and the artist's object, by inevitable vulgarity, but pregnant with genius and high moral teaching.

In spite of his genius, industry, and homely mode of life he never succeeded in acquiring a competency, and was compelled in extreme old age to depend on the aid of his admirers. His true life-work consisted in illustrating the costume, manners, and vices of the people for a period of considerably more than half a century.

Cruiser, an armed vessel which cruises, either to protect the commerce of its own country or to inflict damage on that of another. These vessels are generally built for fast sailing, and are well manned. The cruiser rates technically just below the battleship and just above the gunboat. An armored cruiser has side or vertical armor and horizontal or deck armor. A protected cruiser has horizontal or deck armor only. An unprotected cruiser has no armor. In the United States Navy the name of cruiser is also given to small gunboats. Sometimes in war merchant steamships of great speed are armed to assist a navy, and such vessels are then called auxiliary cruisers. In the Spanish-American war cruisers of this class performed services of great importance to the United States Navy. See NAVY OF THE UNITED STATES, THE; WARSHIP.

Cruive, krūv, in Scotland, a kind of trap used in rivers for catching salmon, made of stakes or hecks, with a large opening by which the salmon may enter but by which they cannot escape, and with smaller openings between the stakes large enough to allow young salmon to escape freely.

Crummell, Alexander, American colored Episcopal clergyman: b. New York 3 March 1819; d. Point Pleasant, N. J., 9 Sept. 1898. His father was a native African and his mother a free woman. He received his education at the Oneida Institute, and in 1839 applied for admission to the General Theological Seminary. His request was refused owing to the intense prejudice against the higher education of the negroes. He accordingly went to England in 1849 and graduated at Cambridge University in 1853. He engaged in missionary work in Liberia 1853–73, when he went to Washington, D. C., and founded St. Luke's Church, of which he was rector until 1895. In 1897 he organized the American Negro Academy in New York. He published: 'The English Language in Liberia' (1861); 'The Future of Africa' (2d ed. 1862); 'The Negro Race Not Under a Curse' (1863); 'The Greatness of Christ, and Other Sermons' (1882); 'Africa and America' (1891).

Crusade, Children's. See CRUSADES.

Crusades (Portug. cruzado, "marked with the cross"), the military expeditions which were sent out by the Christian peoples of the West from the end of the 11th till the latter half of the 13th century for the conquest of Palestine. From the earliest times pilgrims had gone to what, because of Christ's life therein, was called the Holy Land. In 637, Palestine fell into the hands of the Mohammedans, but, though several churches were turned into mosques, Christians were allowed full liberty to come and go to the holy places in Jerusalem for nearly four centuries. In 969, the Fatimite dynasty extended its rule over Egypt and Palestine, and with this change of rulers there came an end of the cordial relations. The insults, and even injuries, that Christian pilgrims suffered aroused bitter feeling in the West. Finally Pope Silvester II. (999–1003), one of the best known of the mediæval popes, and famous for his very practical character, issued a call for volunteers for the purpose of freeing the Holy Land. His summons met with no success. In 1073, Palestine came under the control of the Seljukian Turks and the conditions there became even worse than before for the Christians. Pope Gregory VII. (Hildebrand), in 1074, asked the Western nations for help for their suffering brethren in the East, and even suggested to the German emperor, Henry IV., that it would be easy to raise an army of 50,000 for the rescue of the Holy Land from the hands of unbelievers. The idea of the crusades that had thus been incubating in Western minds for nearly a century did not come to fruition until 1095, when the awful state of affairs that Christian pilgrims had to encounter in the Holy Land became unbearable. Peter of Amiens, surnamed the Hermit, saw the terrible situation while on a pilgrimage to the Holy Sepulchre, and succeeded in arousing the interest of Pope Urban II., and obtained permission to preach a crusade.

The first great cause of the crusades, then, was the earnest desire to free the Holy Land. It seemed to the mediæval Christians to be a question of the maintenance of their religious honor that the infidel should not be allowed to occupy the holy places. Other causes conspired for their occurrence just at this period. It was felt by Western rulers, and especially by the popes, that unless the Turks were repressed in the East, they would gradually acquire irresistible power and eventually invade the West, with hope of success. For the lower classes in the West, on the other hand, life had become almost intolerable because of the oppression of the nobles, the frequent wars, and the almost servile duties that feudalism enjoined. As an addition to other causes of dissatisfaction, the harvest had practically failed in the West for several years, and the year 1095 proved to be a particularly bad year for farmers, and many of those dependent on the land and its products suffered severely from famine. These material difficulties predisposed the people to risk all in the hope of betterment. There was little chance to rise in the West, and the vague opportunities of distant war seemed to promise much. Besides, the spirit of chivalry had come in and many of the nobles devoted themselves to the cause with the idea that they would thus win favor of the heavenly queen, the mother of the Lord whose life had been lived in Palestine and whom they had chosen for their patroness. Devotion to the Blessed Virgin also caused women to urge their husbands, brothers, and other male relatives to join in the holy war for the Christian possession of her home. It needed only the intimation of authority to precipitate an Eastern expedition, and that came very naturally from the popes as the acknowledged spiritual heads of Christendom. Pope Urban II., having heard Peter of Amiens' story of Christian suffering in the Holy Land, summoned a council to meet at Piacenza, and gave Peter the opportunity to address the multitude, which assembled in such numbers that he had to talk in the open air. In the following November 1095, ambassadors from all the nations were present at a

council at Clermont, where Peter's words had so much power that with one voice the multitude called out "God wishes it," and this became the slogan of the crusade.

First Crusade.—In 1096, a number of armed bodies set out in different divisions. Many of these hosts were unamenable to military discipline, and, being unprovided with even the necessaries for such an expedition, were practically completely destroyed in the different countries through which they had to pass before reaching Constantinople, which had been chosen for their place of meeting. Only a few stragglers found their way home again or succeeded in maintaining themselves for a time until the arrival of the more regularly organized bodies of troops which set out the next year. With this body were most of the distinguished men whose names are associated with this first great chivalric effort to redeem the Holy Land from the infidel. At the head of nearly 100,000 men were Godfrey of Bouillon, duke of Lower Lorraine; Hugh of Vermandois, brother to Philip, king of France; Baldwin, brother of Godfrey; Robert II. of Flanders; Robert II. of Normandy, brother of William II., king of England; Raymond of Toulouse; Bohemond of Tarentum, son of Robert Guiscard; Tancred of Apulia, cousin of Bohemond; and other heroes. Tancred is the hero of whom so many poets have sung. He was what Chaucer called "the type of the very gentle perfect knight." It is this first crusade that has formed the subject of Tasso's 'Jerusalem Delivered,' and the poem owed not little of its interest to the fact that it was written while the victory at Lepanto was fresh in the mind of the poet and still well remembered by his readers, for, while the crusades are considered to end with the last quarter of the 13th century, the gathering of the naval force that overcame the Turks under Don John of Austria was really the result of the crusading spirit.

The various armies of the First Crusade gathered at Constantinople about Christmas 1096. Here they were delayed for some time by the diplomacy of the Greek emperor, who wished to be assured that the immense forces, which had come partly as the result of his own request for aid, would not prove the ruin of his tottering empire. About Pentecost, 1097, the Crusaders crossed over to Asia by the Strait of Gallipoli, and their first conquest was the town of Nicea in June 1097. Shortly after this, on 4 July, the Crusaders met an Eastern army in pitched battle for the first time, at Dorylaeum, and routed and put it to flight. The crusading army now marched through Asia Minor until they reached Antioch. They would probably have been long delayed in the siege of this town but for treachery which threw it into their hands in June 1098. The citadel, however, remained in possession of the Turkish garrison. Before they captured it, they themselves had to stand siege in Antioch from a Turkish army which surrounded the town soon after its capture. After three weeks of siege the Crusaders were reduced to a very pitiable condition, but on 28 June they made a vigorous sortie and succeeded, in spite of their famished and exhausted condition, in completely routing the Turkish besiegers. The Crusaders remained nearly a year in the neighborhood of Antioch, and only in May 1099 was the march against Jerusalem begun. The siege of the city was commenced early in June. Finally, after six weeks of a fierce siege, the city was captured by a two days' storming, on 15 July. Godfrey of Bouillon was chosen king of Jerusalem, but humbly refused to wear the king's crown on the spot where the Saviour of the world had worn a crown of thorns. He accepted as his designation instead of king that of Defender of the Holy Sepulchre. After scarcely a year of sovereignty, however, he died in 1100 and was succeeded by his brother Baldwin. Baldwin had separated from the main army of the Crusaders while it was in camp in the neighborhood of Antioch, and had proceeded to Edessa. This city was in possession of a Christian prince, who was able to maintain himself only with difficulty against the Mohammedans. Baldwin concluded a treaty by which he agreed to aid this prince against the Mohammedans on condition that he himself should be his successor on his death. This treaty was made in February 1098, and, as the Prince of Edessa was killed soon after in a popular insurrection, Baldwin asserted effectually his claims to succeed him, and soon made himself ruler of an extensive territory stretching even beyond the Armenian Mountains and the plain of Mesopotamia. He was accordingly his brother's natural successor as the ruler in Palestine.

Second Crusade.—In 1144 the Saracens recaptured Edessa. This produced great consternation throughout Europe, because it was feared that the other acquisitions made by the Christians during the First Crusade would also fall once more into the hands of the infidels. As a result, Pope Eugenius III. called upon St. Bernard of Clairvaux to preach the Second Crusade. The two leaders of the expedition were the German emperor, Conried III., and the king of France, Louis VII. They collected about 140,000 men, and in 1147 led them to the East. Notwithstanding the enthusiasm with which this crusade had been entered upon, for it is recorded that after Bernard's sermon, it happened more than once, that enough crosses not having been provided for all those who wished to assume the cross, that is, to promise to go on the crusade, Bernard had to cut up his garments in order to supply them, the army failed of its purpose of recapturing Edessa, and indeed only served by its presence still further to weaken the already almost tottering kingdom of Jerusalem. The crusading armies returned to Europe in 1149, and it was nearly 50 years before any other attempt was made to diminish the domination of the Saracens.

Third Crusade.—In 1187, Saladin took Jerusalem from the Christians and the zeal of the West blazed out once more. The three principal monarchs of Europe, Frederick Barbarossa, emperor of Germany, Philippe Augustus, king of France, and Richard Cœur de Lion, of England, offered to lead their armies in person against the Saracens. Frederick's army succeeded in reaching the Holy Land only after having overcome an immense Turkish army at Philomelium, 7 May 1190. Not long after his victory Barbarossa was drowned in the river Kalykadnos, and this took all the spirit out of his troops. His son Frederick led the army to the siege of Acre, but after his death, in January 1191, the German army abandoned the expedition. Philip and Richard agreed to unite their forces at Messina, in Sicily. Here they stayed until the spring of 1191. Philip reached the Holy Land on the day

before Easter and joined the other Crusaders before Acre. Richard's fleet was dispersed by a violent storm, and his wife and mother were detained as prisoners on the Island of Cyprus, to which their vessel had been driven, by Isaac Comnenus, the heartless, despotic ruler of the island. On Richard's arrival from Rhodes, where his vessel had been compelled to put in, he succeeded in taking Isaac and his daughter prisoners and had himself proclaimed king of Cyprus. 'Twas not until the beginning of June that he joined the French at Acre. Owing to jealousies between the two monarchs, the French king abandoned the expedition shortly after the fall of Acre. Richard succeeded in many wonderful exploits against the Saracens, but was not able to accomplish much in regaining territory. He did not succeed in recapturing Jerusalem, and, though he defeated Saladin at Azsoof and captured Jaffa, he at last despaired of the capture of Jerusalem and made a truce with Saladin by which the sea-coast from Tyre to Jaffa remained in the possession of the Crusaders, and Christians were allowed full liberty to visit the Holy Sepulchre.

The Fourth Crusade was due to the zeal of Pope Innocent III. Its chief promoters were Godfrey of Champagne, Baldwin, Count of Flanders, and Dandolo, the old Doge of Venice. The Marquis of Monteferrat was chosen leader of the expedition. The Crusaders assembled at Venice and were induced by Dandolo to attack Zara in Dalmatia, a town which had formerly belonged to the Venetians but which had renounced its allegiance. This was contrary to the wish of the Pope, who excommunicated the Crusaders for their failure to fulfil their vow of proceeding to the Holy Land. News now came to the Crusaders' camp that there was a revolution in Constantinople and their aid was asked for one of the claimants to the throne. Dandolo seems to have been mainly responsible for encouraging the Crusaders to accept the invitation to proceed to Constantinople, and as a result the crusade was entirely diverted from its original purpose. In 1203, Constantinople was taken by the Crusaders, who established therein a Latin empire.

Children's Crusade.—The failure of so many expeditions to the Holy Land proved very discouraging and people began to wonder if there was not some cardinal fault in the make-up of the parties that went on the Crusade. It began to be said that the Holy Land would never be captured, except by those who were innocent. Accordingly, when Stephen, a French peasant boy, in June 1212, began to preach a children's crusade, he made many converts to his opinion that possibly children might accomplish what adults had failed in. Some thirty thousand French children are said to have taken part in the expedition. A like movement began in Germany and soon proved to have almost as great a following. Over 20,000 German children crossed the Alps into Italy. Both expeditions, as might have been expected, came to grief. The French children were tempted on board vessels by designing slave merchants in Marseilles, and many of them were sold into slavery. Many of the German children lost their lives through the hardships they had to endure on the march. Some were lost at sea and some settled down here and there throughout Italy.

These expeditions represent a phase of that tendency to psychic contagion that sometimes comes over even intelligent people in an inexplicable way, and it is from this standpoint that they have been very much discussed in recent years. The Children's Crusade corresponds to the witch baiting of more modern times, or to some of the many spiritual manifestations of older periods. Some doubts have been thrown on phases of the history of the Children's Crusade, as for instance the fate of the French children, but there seems good reason to believe the account given here to be correct. (See Winkelmann, 'Geschichte Kaiser Fredrichs II.,' and Röhricht's article in 'Sybels Histor. Zeitschrift,' 1876.) In English there is the popular account by Gray, 'The Children's Crusade,' New York 1871, and in French, 'Des Essards La croisade des enfants,' Paris 1875.

Fifth Crusade.—After an interlude of five years, after the Children's Crusade, a Hungarian expedition went to Egypt and captured Damietta. There was so much disaffection among the Crusaders themselves, however, that the expedition had to be abandoned. This is sometimes spoken of as the Fifth Crusade. What is more usually called the Fifth Crusade was led by Frederick II. of Germany and owed its inception to Pope Honorius II. and to Pope Gregory IX. A pestilence broke out in the army just as it was ready to sail and this delayed the expedition. Frederick seems to have lost heart after this and retired to Pozzuoli, near Naples, thus incurring the displeasure of Pope Gregory IX., who put him under a ban of excommunication. The next year, nevertheless, Frederick went to the Holy Land and without giving battle succeeded by negotiation with the Sultan in securing for himself the Kingdom of Judea, only on condition, however, of tolerating in this kingdom the Mohammedan religion. He was crowned king and concluded a truce with the Sultan for ten years; but this was soon broken.

The Sixth and Seventh crusades were led by St. Louis IX. of France. He considered that the centre of the Moslem dominion was in Egypt and he resolved to strike his blow there. He laid siege to Damietta and captured the city in June 1249. In his march up the Nile, however, his army became involved in the mazes of swamp and streams of the river and was defeated. Forced to retreat, it was overtaken by the army of the Sultan, where resistance was hopeless, and the king and his whole army had to surrender. Louis's ransom was the city of Damietta. After waiting for a time for reinforcements, he returned home. Twenty years later the saintly king undertook the Seventh Crusade. He landed his army in 1270 on the northern coast of Africa and after a large number of his knights had perished, he himself died before Tunis. Peace was concluded and the French Crusaders returned home. About the same time an English army under Prince Edward, afterward Edward I., proceeded to Syria. Finding that little could be accomplished, they concluded a truce for ten years and then returned to England. For about twenty years after this, the remnants of the Latin kingdom in Palestine succeeded in maintaining themselves independent. Acre was captured by the Sultan of Egypt in 1291, just one

hundred years after it had been originally taken by Richard Cœur de Lion, and this obliterated the last remnant of the kingdom that had been founded by the Crusaders.

The results and significance of the crusades for western Europe and, indeed, for the civilized world of all after times, are out of all proportion to the little that was accomplished in Palestine. The result of the intercommunication of nations caused by a series of joint enterprises, could scarcely fail to bring with it broadening of views and the intellectual development consequent upon friction of minds trained so differently. In merely material progress, the most noteworthy effect was upon commerce. The use of many Eastern luxuries was introduced into Europe and as a result, the cities of Italy especially acquired commercial importance. The commercial spirit thus aroused and the impetus of the later crusades gave rise to the Hanseatic League, which marks the first great step in modern commercial progress. In every branch of art and knowledge the effect of the crusades soon became evident. There has been in recent times a renewed interest in the 13th century. There are some who do not hesitate to say that the thirteenth is one of the greatest of centuries because of what it represents of accomplishment in the arts and of development of the human mind as well as the rise of human liberty. Nearly all of the movements that led up to such accomplishment can be traced to the crusades. In the East, the Europeans had come in contact with Arabian philosophy and Arabian mathematics, and the consequence was an interest in these subjects that spread very widely and that eventually gave rise to the university and even to the development of such advanced physical science as was taught by Albertus Magnus and Roger Bacon. The interest of the Crusaders in Byzantine architecture and arts led to the development of a taste that soon created a demand that must be satisfied. Gothic architecture has been traced to Eastern influences. The other great arts of the 13th century, statuary, stained glass working, book illumination, metal working in its various forms and needlework, all owe their inspiration to Eastern sources. That they were developed quite beyond the models that had been seen by Europeans is due to the fact that the generations following the crusades had traditions of accomplishment that led them to raise their genius to the highest possible point of accomplishment. Great political benefits in the crusades must not be overlooked. Many of the nobility lost their lives and many more lost their fortunes and their power, and as a consequence government became more centralized and national. This was especially true in France, and as a consequence peace was easier to maintain. The honors conferred on many of the Crusaders gave them opportunities to rise such as they would not otherwise have had. The distribution of wealth brought about by the heavy expenses that were incurred gave opportunities for many of the poorer classes to enter into industrial and commercial occupations. The very independence of mind that had been acquired by the distant expeditions created a spirit of enterprise and made men much more ready to try far-off adventures and even commercial speculations, than was the case before. Undoubtedly to the crusades is owed more of what is distinctive in modern Europe than to any other connected series of human events.

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Crushing and Grinding Machinery. These machines are employed to reduce hard or fibrous substances to a fragmentary condition, or to the form of a fine powder.

Crushing machines are used for purposes of coarse reduction. They consist of various forms of "stamps" or stamp-mills, crushing rolls, gyratory crushers, etc., and are employed to reduce metal ores for subsequent treatment by the processes of amalgamation and concentration; for crushing sugar cane and other fibrous materials, and for crushing coal and coke.

For preliminary crushing, that is, for preparing material for finer crushing by various forms of stamps, rolls, and rotary mills such as those described in detail under the title "MINING AND MILLING MACHINERY," the types of machines usually employed are the jaw crushers and the gyratory crushers. Of the former, the "Blake," the "Dodge," and the "Buchanan" crushers are among the most familiar and extensively used types.

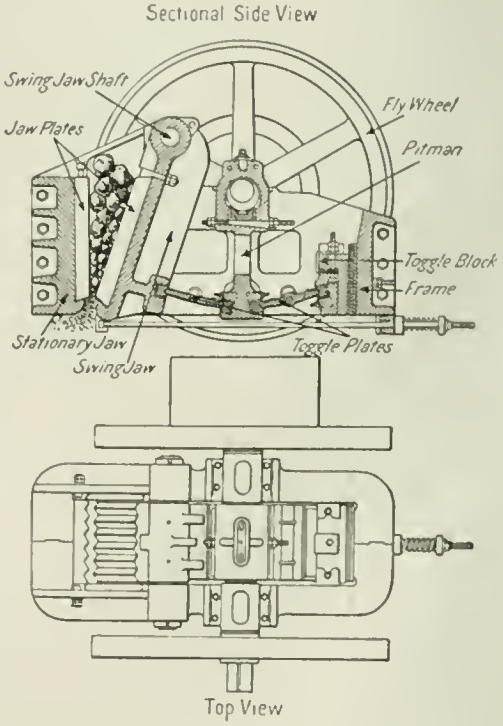


FIG. 1.

Fig. 1 illustrates a vertical section and a top view of a "Buchanan" stone crusher. It consists of a cast steel frame carrying two steel jaws, one fixed and one movable, which are arranged to form a V-shaped opening. The movable or swing jaw is hinged at the top and is connected with suitable mechanism by which

it is alternately pushed forward and backward, to and from the fixed jaw, thus alternately reducing and enlarging the V-shaped opening. The material to be crushed is introduced at the top of the opening, and is reduced by the reciprocating motion of the swing jaw to a size fine enough to allow it to pass through the smaller outlet at the bottom of the opening. The adjustment to crush fine or coarse is made by means of removable steel liners placed between the planed surfaces of the frame and the main toggle block. The stroke is adjusted by means of jaw liners of steel placed between the top of the main toggle bearing and the bottom of the steel lugs cast on the frame so that the angle of the toggle can be increased for lengthening the stroke, or it may be flattened to diminish the same. For increasing the stroke one or more liners are added, and by this means a variation of about fifty per cent is obtained in the throw of the jaw. The receiving openings of these crushers range in size from 1½ x 3 inches to 24 x 30 inches; their weight ranges from 160 to 60,000 pounds; they require from 4 to 65 horsepower to operate them at 250 revolutions per minute, and are capable of reducing the rock supplied to them into fragments ranging from 1 to 3 inches in size at a rate ranging from 4 to 35 tons per hour, according to the size of the machines. The capacity of a rock breaker depends on the distance between the jaws, and the number of revolutions of the power wheel. The amount of product is also affected by the kind of rock, the hard, brittle variety will go through faster than the sandstones and other tough rock. The accompanying table of "Relative Hardness of Elements and Ores" will serve to give a general idea of the relative powers required to crush them. It is important to note, however, that the power required will depend very much on the relative proportions of the mineral to the gangue matter; for example, galena may occur in a quartz gangue, and if the proportion of galena is very large, the hardness of the ore will be near the scale for galena as shown in the table; but, if the proportion is very small, the hardness of the ore will be near the scale for quartz.

RELATIVE HARDNESS OF ELEMENTS AND ORES.

Element or Ore	Character	Hardness
Diamond	Brittle	10
Iron	Malleable	4 to 5
Platinum	Malleable	4 to 4.5
Arsenic	Brittle	3.5
Antimony	Brittle	3 to 3.5
Gold	Malleable	2.5 to 3
Silver	Malleable	2.5 to 3
Copper	Malleable	2.5 to 3
Bismuth	Brittle	2 to 2.5
Sulphur	Brittle	1.5 to 2
Lead	Brittle	1.5
Graphite	Inelastic	1 to 2
Corundum	Brittle to tough	9
Beryl	Brittle	7.5 to 8
Wolfram	Brittle	7.2 to 7.5
Quartz	Brittle to tough	7
Garnet	Friable to tough	6.5 to 7.5
Iron Pyrite	Brittle	6 to 6.5
Magnetic Iron Ore	Brittle	5.5 to 6.5
Copper Pyrites	Brittle	3.5 to 4
Mispickel	Brittle	5.5 to 6
Hornblende	Brittle	5 to 6
Fluor Spar	Brittle	4
Magnetic Pyrite	Brittle	3.5 to 4
Dolomite	Brittle	3.5 to 4
Spathic Iron	Brittle	3.5 to 4
Malachite	Brittle	3.5 to 4
Mica	Laminated	2.2 to 5
Gray Copper	Rather Brittle	3 to 4
Cerrusite	Very Brittle	3 to 3.5
Heavy Spar	Brittle	2 to 2.5
Copper Glance	Brittle	2.5 to 3.5
Galena	Brittle	2.5 to 3
Ruby Silver Ore	Brittle	2.5 to 2.75
Silver Glance	Malleable	2.5
Sylvanite	Brittle	1.5 to 2
Talc	Inelastic	1 to 1.5

Compounds of the heavy metals, such as gold, silver, copper, lead, etc., are soft, their hardness rarely exceeding 2.5 to 3; while that of the compounds of the arsenides and oxides of iron, nickel and cobalt, are relatively hard, ranging from 6 to 6.5. Most of the sulphides, carbonates, sulphates and phosphates are soft. The conspicuously hard minerals are found chiefly among the oxides and silicates. The weights of the various ores differ within very wide limits. A spongy dry quartz containing very little metallic sulphurets is naturally much lighter than a wet dense quartz heavily charged with galena. Broken quartz sent to the mill generally ranges from 15 to 22 cubic feet per ton, and a convenient size of truck for handling the same is one having a capacity of about half a ton.

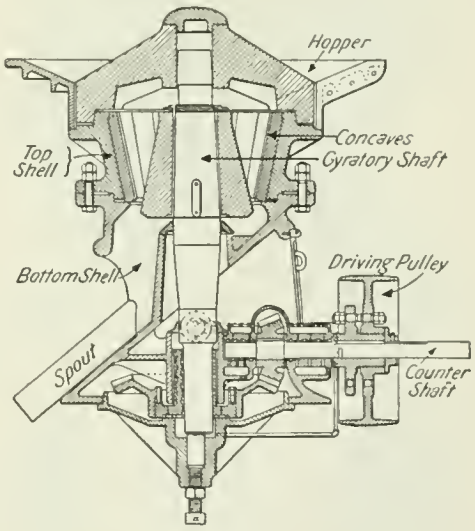


FIG. 2.

Gyratory Crushers.— In these machines, the crushing elements consist of an inverted hollow frustrum of a cone within which an upright frustrum of a solid cone is given a gyratory motion by a vertical shaft connected with a counter shaft operated by a suitable propelling mechanism. The vertical shaft is hinged at the top, and the material dumped into the hopper is crushed in the annular space between the walls of the two cones until it is fine enough to pass down and out of the openings at the bottom. The McCully and the Austin gyratory crushers are among the best representatives of this class of machines. Fig. 2 illus-

trates a vertical cross section of the Austin crusher. These machines are adapted to produce a much finer grade of crushed material than those of the jaw crusher type.

Crushing rolls are made in a great variety of forms, and are used for the production of a

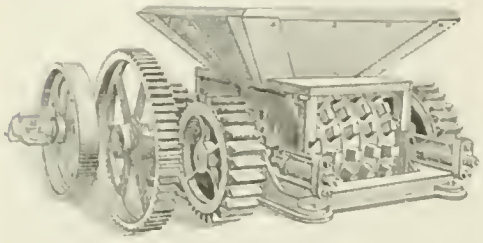


Fig. 3.

much finer grade of crushed material than that obtained by the use of the machines already described. In some of them the rolls are equipped with removable steel teeth. Such ma-

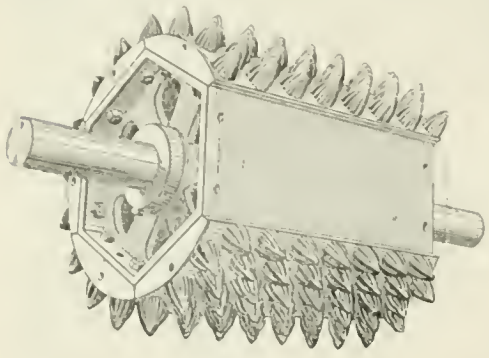


Fig. 4.

chines are used by the smelters for the coarse crushing of slag shells from slag cars and pots. Other forms have corrugated rolls, while the coal crushers and the coke crushers and sizers

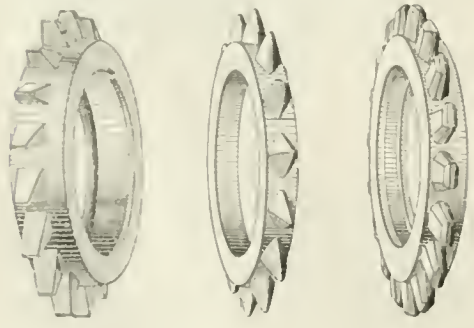


Fig. 5.

have rolls equipped with teeth of special design adapted for the crushing and sizing of the product according to the sizes demanded by the industrial and commercial trades. Coal crushers are described in detail under the title "Coal Mining Machinery," while Fig. 3 illustrates a "Jeffrey" coke crusher and sizer. It is equipped with a feed hopper the form of which may be arranged to suit any required condition, and the rolls are made in segments with removable teeth, as shown by Fig. 4, or of interchangeable tooth rings, as shown in Fig. 5.



Fig. 6.

An external view of a set of plain crushing rolls is given in the article under the title Mining and Milling Machinery, together with a general description of the same, but Fig. 6, showing a sectional view of a "Humphreys" crushing rolls, is introduced here to convey a more detailed idea of the internal arrangement of the principal parts of these machines. Va-

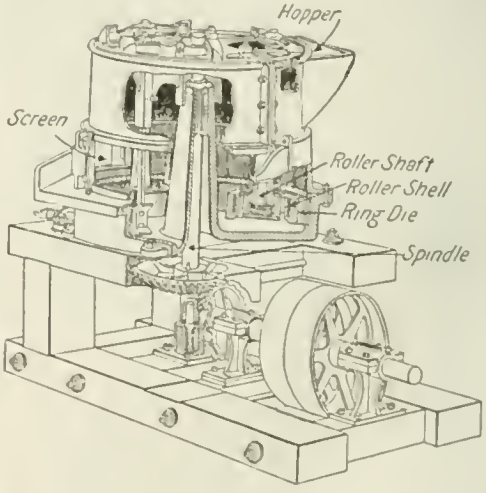


Fig. 7.

rious forms of roll crushers are also used for crushing sugar cane and other fibrous materials.

Other forms of crushers in common use are the "coffee mills," which, while resembling the gyratory crushers, yet differ from them in that the vertical shaft has only a simple rotary motion without gyration; the "edge runner" crushers consisting of a vertical axle which carries a number of radial arms with heavy metal wheels attached to their outer ends. The rotation of the vertical axle causes these wheels to travel in a circular track on the bottom of a metal trough containing the material to be crushed; and sausage mills consisting of a longitudinal shaft carrying radial teeth which

intermesh with similar teeth projecting from the inside of the cylindrical containing shell.

Grinding and pulverizing machines are used in many processes to reduce the products of the crushers. They are commonly known as mills, and are necessarily of a different char-

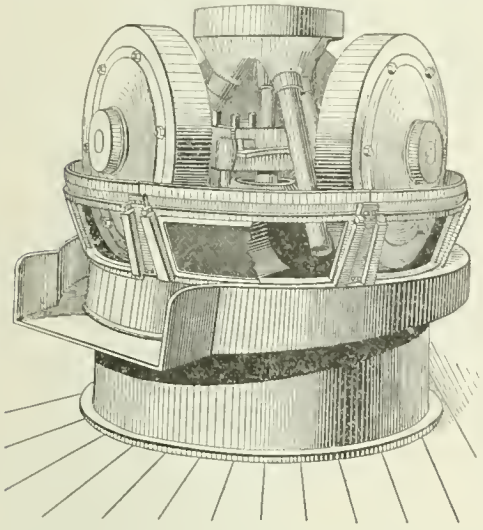


Fig. 8.

acter and of lighter construction than the crushing machines.

In the simple mill-stone mill, two stones set vertically one above the other, one fixed and the other rotated by a vertical shaft, are placed face to face. Usually the upper stone is the

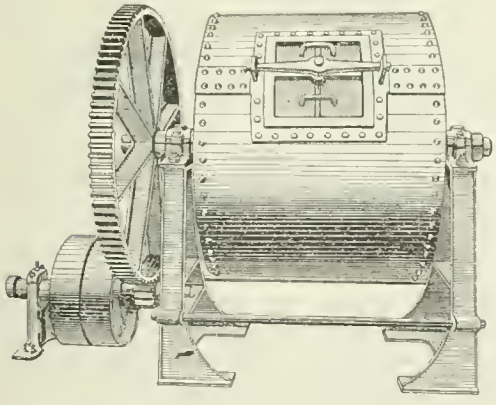


Fig. 9.

movable one, and has a central hole into which the material to be ground is fed. As this stone is revolved, the material is ground between the stones and passes out through grooves in their faces to the edge, where it is caught by a suitable receiver.

The best representatives of the ore-grinding machines are the "Huntington" and the "Chilian" mills. Fig. 7 shows a partly sectional detailed view of a Huntington mill. The ore and water fed into the mill at the hopper is thrown against the ring-die by the rotating rollers and scrapers, where it is crushed by the centrifugal force of the rollers to any desired

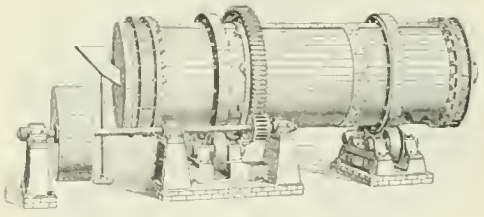


Fig. 10.

degree of fineness, and then discharged through the screens in the form of a fine pulp suitable for concentration.

Fig. 8 illustrates a "Davis" Chilian mill. It consists of a heavy cast iron pan with an annular die. The periphery of the pan is provided with screens. A vertical driving shaft is journaled in the centre of the pan and is driven from below by bevel gears on a countershaft connected with the driving pulley. Three crushing rolls are driven from the vertical shaft by axle bearings so designed as to allow the rollers to swing in a vertical plane. The material

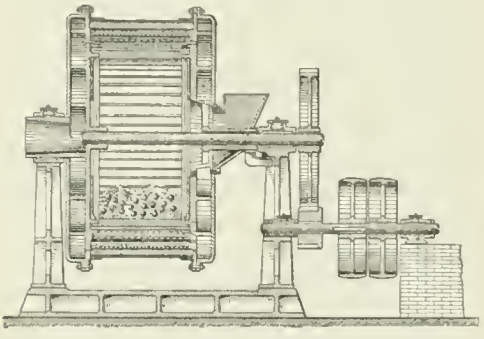


Fig. 11.

to be crushed is delivered into a central hopper carried on the driving shaft, and is distributed by suitable spouts in front of each roll. Scrapers are provided to prevent packing, and ensure proper circulation for the screens.

Other forms of machines used for fine grinding are the "pebble mills," "tube mills," and "ball mills." Of these, there are two principal types — those in which metallic balls of hardened steel, comparatively large in size, travel around a fixed track, and those in which the balls revolve loosely in a rotating drum. In the former, the material is ground between the rotating balls and the path on which they travel, and in the latter, by the constant movement and fall of the balls which are fed into the mill with the material. In many forms of these machines pebbles of flint are substituted for the balls of hardened steel.

Fig. 9 illustrates the general form of a pebble mill. The principal dimensions are as follows: The size of the cylinders range from 30 x 19 inches to 6 x 8 feet; the charge, taking

sand as the unit of measure, ranges from 120 to 4,000 pounds; and the size of pulleys range

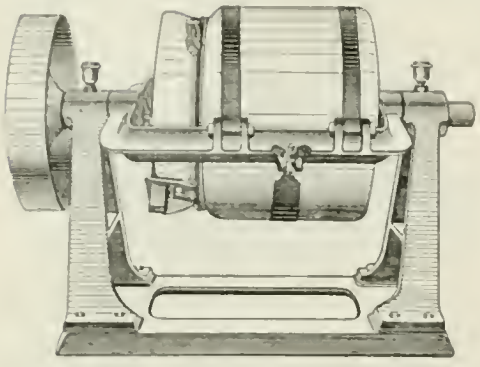


Fig. 12.

from 24 x 4 inches to 36 x 12 inches in diameter. These machines require from one to eighteen horsepower to drive them in dry-grinding, and from one-half to nine horsepower, in wet-grinding, at cylinder speeds ranging from 44 to 13 revolutions per minute.

Fig. 10 illustrates a tube mill of the ordinary type. The general principle of grinding employed is similar to that of the pebble mills, but with the difference that the material to be ground in the tube mill is fed at one end, and delivered as a finished product at the other end, its fineness being regulated simply by the speed at which the material is fed into the machine. As every particle of the material must pass under the grinding action of the entire charge of pebbles, a thorough and uniform grinding is the result, and the use of sieves is unnecessary.

Fig. 11 shows a vertical cross-section of an "Abbe" ball mill.

Jar-mills, consisting of porcelain jars in which pebbles are rotated together with the material to be ground, are extensively used for the grinding of paints, ink, and other chemical compounds. They are composed of one or more grinding jars. Fig. 12 shows a machine of the single jar type. Its outside dimensions are about 12 x 13 inches; it uses a charge of porcelain balls weighing about 22 pounds; and is capable of grinding up to 15 pounds at a charge, when running at 50 revolutions per minute.

Impact Pulverizing Machines are represented by the "Max" mills and various forms of "Raymond" pulverizers. The principle employed is that of percussion, the working device consisting of a vertical shaft attached to a carrier provided with hardened steel beaters. As the material is fed into the mill it is thrown by centrifugal force against a hard iron plate, the particles at the same time being thrown into violent contact with each other. Equipped with vacuum air separators they are extensively and economically used for the reduction of all kinds of dry colors and chemicals, and for the threshing, cleaning, and separating of tobacco stems.

The mechanical apparatus required to effectively apply this system of air separation should be capable of satisfying the following conditions: (1) To expand and rarify the air so that the coarser particles will fall out of the current and allow it to deliver the impalpable powder at the discharge spout. (2) When a large output of the finely ground material is required per hour, the apparatus should be capable of using an amount of air sufficient to lift the total weight of the charge of raw material. (3) When using a large volume of air, sufficient room should be provided for its expansion and rarefication so as to obtain a current light enough to carry away the impalable

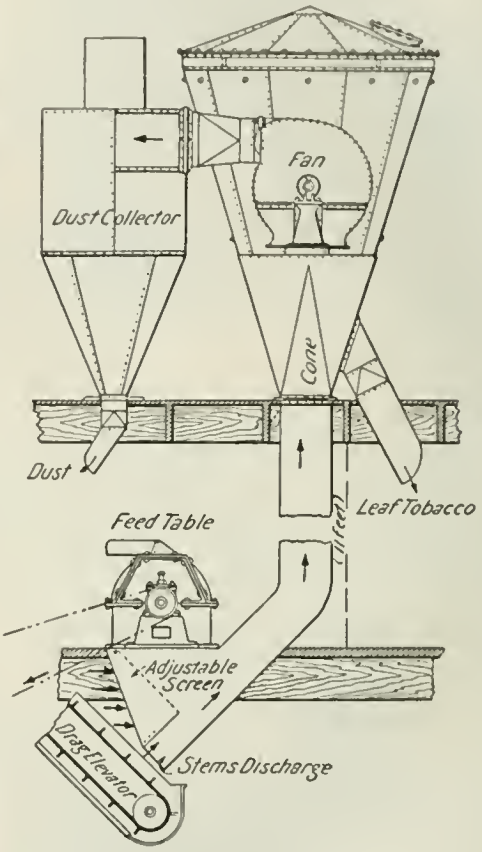


Fig. 13.

powder only. (4) The apparatus should be so constructed that the coarse particles will fall out of the light air current by gravity into the contracted portion of the separator where the blast is stronger, and thus pass out through the tailing spout or into the pulverizer to be reground, without being accompanied by any of the fine powder. (5) The air space within the apparatus should approach as near as possible to a perfect vacuum.

As the fineness of the product depends upon the size of the separator, almost any limit of grinding is readily obtained by making the apparatus of sufficient size to produce the proper relative expansion and rarefication of the air. When it is desired that the finished product should be an extremely fine powder, the use of

the large-sized separators will give the best results; but, for products of medium grades of fineness, and large output, the smaller ma-

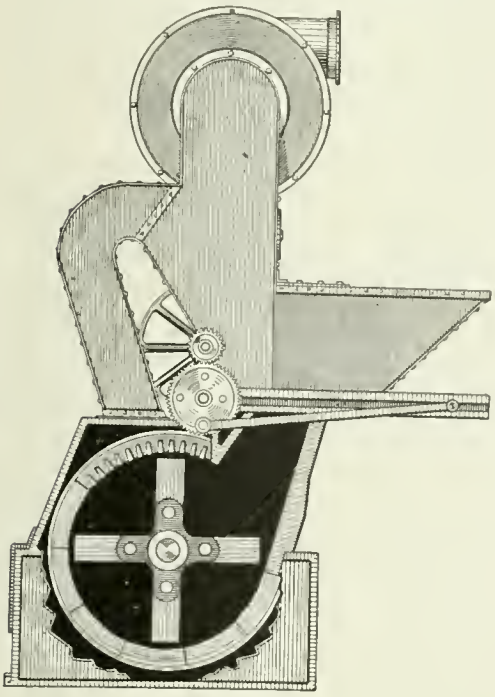


Fig. 14.

chines with fan and dust collector attachments are the most effective.

Fig. 13 illustrates a Raymond impact pulverizer and vacuum separating plant as erected for the cleaning and separating of tobacco stems. The material is fed to the machine by the operator in a manner similar to the feeding of a threshing machine. The perforations of the screen surrounding the pulverizing cylinder vary in size in proportion to the fineness desired. As the stems come in contact with the rapidly revolving beaters, the particles of the leaf are liberated therefrom, and passing through the screens with the stems are caught by the air current and drawn up into the separator, which expands the air so that all the light pieces of stems drop back and are discharged through the opening at the bottom into the drag elevator. The particles of leaf drop into the centre cone of the separator and discharge from the spout, while the dust is carried through the fan into the dust collector and discharged therefrom.

Fig. 14 shows the general arrangement of a type of pulverizing machinery called shredders, which are extensively used in tanneries, paper mills, chemical works, tobacco factories, and extract plants. The shredding of the material is accomplished by the wearing action of the hammers attached to the revolving shaft, against the teeth on the inner surface of the cylinder. For the separation of material reduced to a fine powder an exhaust fan carries the material through the outlet to the receiving receptacle.

Arrastra Machinery.— Arrastra plants are employed for the reduction of metallic ores into a fine pulp which is subsequently treated by the patio or some other process and the pure metal separated from the accompanying impurities. The bottom of the arrastra is paved with stones 10 x 10 inches square, made of the best granite and set vertically to the depth of about three feet in the ground. The outside is constructed of flat stones which project from eighteen to thirty inches above the floor. Line shafts driven by engine power extend over this floor and operate poles or arms which revolve and move the "dragging stones" over the granite floor and thus accomplish the reduction of the ore fed into the arrastra to a fine pulp. These stones are made of the best granite, and range in weight from 11,000 to 25,000 pounds. The ore is first prepared by being passed through the jaw-crushers of a primary crushing plant. From these machines it passes through a set of crushing rolls and is dropped automatically into revolving screens which separate the fine pulp from the coarser grindings. The last-named material is sent back and passed again through the crushing rolls until all of the pulp is fine enough to be finally treated in the arrastra. Each arrastra requires about six horsepower for its operation, and range in crushing capacity from six to ten tons each, per twenty-four hours, according to the character of the ore.

For other forms of crushing and grinding machinery, and their special application, see articles under the titles Brick Making Machinery, Coal Mining Machinery, and Mining and Milling Machinery, in this Encyclopædia.

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Crusius, Christian August, German theologian and philosopher: b. Leuna, near Merseburg, 10 Jan. 1715; d. Leipsic 18 Oct. 1775. He received his education at Leipsic, where later he became professor of theology, a position which he held until his death. He vigorously attacked the philosophy of Leibnitz and Wolf as being incompatible with the dogmas of the Christian Church, and at the same time put forth his own philosophy, which he claimed to be perfectly orthodox. His philosophy subordinated the scholastic principle of contradiction to that of conceptibility; gave to the soul faculties and liberties almost as limitless as those of the Deity; propounded psychology as the basis for logic; and regarded time and space as modes of divine existence and not as substances. Among his works the most important are: 'Entwurf der nothwendigen Vernunftwahrheiten' (1745); 'Logik, oder weg zur Gewissheit und Zuverlössigkeit der menschlichen Erkenntniss' (1747); 'Anleitung über natürliche Begebenheiten ordentlich und vorsichtig zu denken' (1774).

Crusius, Otto, German philologist: b. Hanover 20 Dec. 1857. He has been a professor in the University of Heidelberg and has written: 'Zur griechischen Religiousgechichte' (1886); 'Untersuchungen zu den Mimiamben des Herondas' (1892); and has also edited 'Philologus; Herondas' (1901); 'Fabeln des Babrius' (1897); 'Griechische Lyriker' (1897); etc.

Crustacea, krŭs-tā'shĕ-a, a primary group (phylum) of animals represented by the bar-

nacle, lobster, crayfish, shrimp, and crab. Crustacea differ from other arthropod animals. The body consists of about 20 segments which in the more specialized forms are grouped into two regions, the head-thorax (cephalothorax) and hind body or abdomen. The segments of the cephalothorax are fused together so that the limits between the segments are lost, and the whole mass is protected by the shield or carapace. The skin is thick and rendered solid by the deposition of lime (carbonate and phosphate), so that the integument forms a dense crust, hence the name Crustacea. They differ from trilobites and king crabs (qq.v.) in having two pairs of antennæ, while they breathe by means of gills attached to the legs. Like the other marine arthropods named, they have legs which are divided into two divisions, an outer (exopodite) and an inner (endopodite). Crustacea differ from the *Palæopoda* also (trilobites, merostomes and arachnids) in the high degree of specialization of their appendages, there being from three to six kinds, with corresponding functions, while in the trilobites, so far as we know, the single pair of antennæ are succeeded by numerous (over 20) pairs of legs, all of the same shape and functions. In the head-thorax, besides the antennæ, there is on each side of the mouth a pair of mandibles, each with a palpus, two pairs of maxillæ or accessory jaws, which are flat, divided into lobes, and of unequal size; three pairs of foot-jaws (maxillipedes), which differ from the maxillæ in having gills like those on the five following pairs of legs. There are thus 13 pairs of cephalothoracic appendages, indicating that there are 13 corresponding segments; these, with the seven abdominal segments, indicate that there are 20 segments in a typical crustacean. There are six pairs of swimming legs (swimmerets), the last very broad in the lobster and shrimp, with the telson forming the "tail-fin."

The Crustacea as a rule respire by gills. These, as in the lobster and crab, are composed of a series of little filaments into which the blood flows to be aërated. The filaments branch out from a common stalk which grows out of the basal joint of the five pairs of legs and the three pairs of foot-jaws. These gills are folded up toward the back, and are contained in a sort of chamber made in part by the carapace. In shrimps, lobsters, and crabs the sea-water passing into the cavity between the body and the free edge of the carapace is afterward scooped out through an opening or passage on each side of the head by the movements of membranous flaps called "gill-bailers." The digestive organs are well developed, especially the fore stomach, in the hinder part of which are several very large calcareous teeth for crushing the food, serving, when closed together, as a strainer through which the partly digested food presses into the long slender straight intestine, which ends in the telson. The liver is very large, as in all marine arthropods, or in such terrestrial types as the scorpions and spiders, which are derived from the king crabs. The brain of the higher Crustacea is very complex, corresponding with the complicated reflex movements of an animal composed of so many segments, and bearing such a complicated series of appendages devoted to so great a variety of functions. The eyes are usually compound or many-faceted, and are mounted on freely movable stalks. The ear is a sac in the basal joint of the smaller or second pair of antennæ. The organs of smell are usually well developed, as Crustacea mainly depend on this sense in finding their food. These consist of minute delicate sensory rods on the smaller antennæ. The hairs fringing the mouth-parts and legs are often delicate tactile organs. The green glands in the head function as kidneys, and open out at the base of the larger antennæ.

With only a single known exception (*Squilla*), Crustacea carry their eggs about attached to the swimming or other legs. The eggs of some crabs (*Neptunus*) are minute and excessively numerous, their number amounting to millions, while the lobster may produce from 20,000 to 80,000 eggs. Crustacea pass through a well-marked metamorphosis, nearly all (except the amphipods and isopods) hatch from the egg as a larva called a "nauplius," which has an oval non-segmented body, with three pairs of appendages, by which it swims about at the surface of the sea. After a series of molts, at each of which new segments with their appendages arise, they finally reach maturity. The shrimps and crabs hatch in a more advanced larval stage called the zoëa, the nauplius stage being partly suppressed and thrust back into the embryo period. The zoea has a head and abdomen, but no thorax: this, however, is developed later, and after a series of molts the parent form is attained.

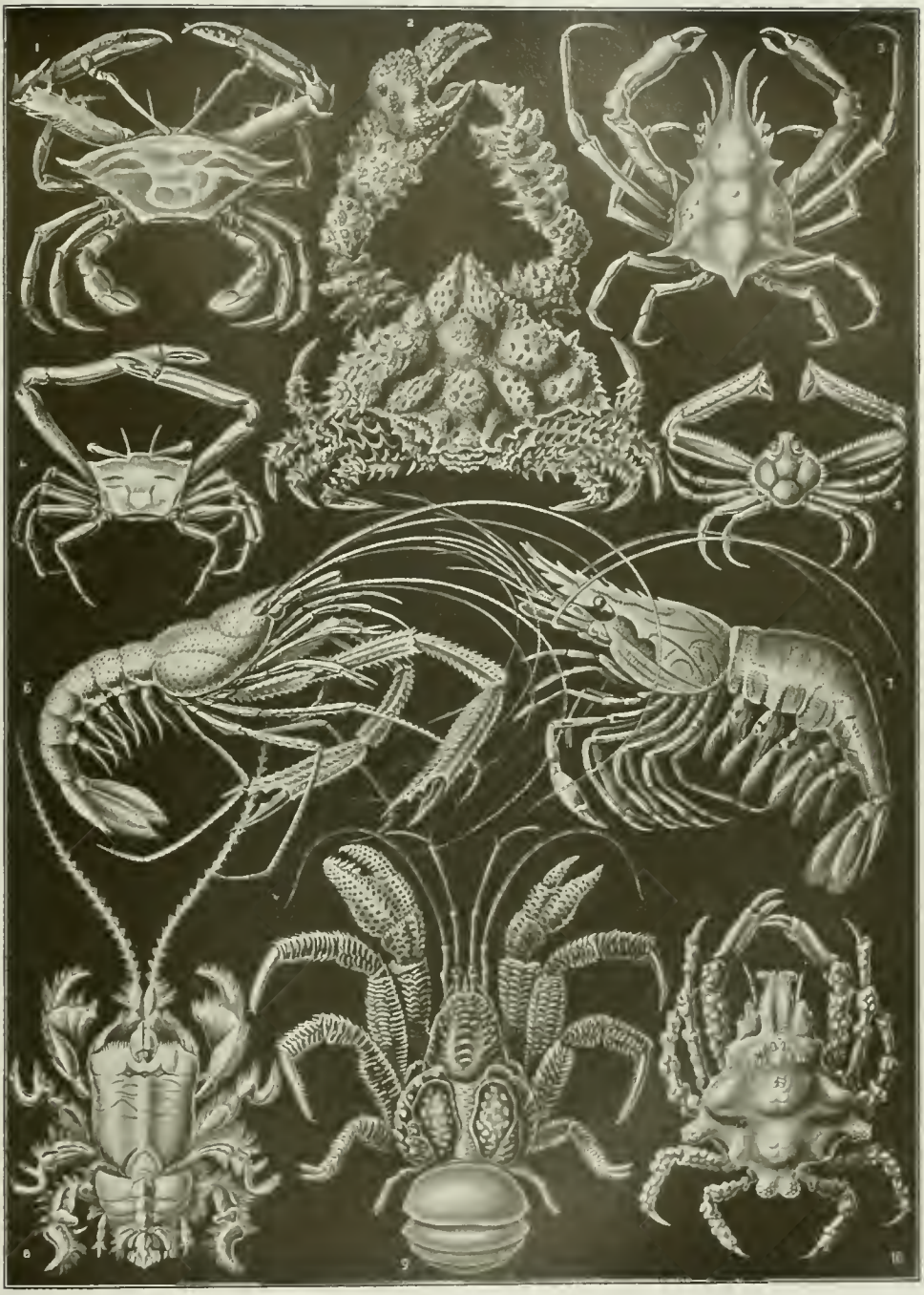
The process of molting is a precarious one, not infrequently resulting in death. The crust being too solid to admit of a continuous growth, and increase in size being rapid, frequent sheddings of the skin are necessary. In the lobster, the old skin being detached from the under cellular layer by the secretion of the new cuticle beneath, it ruptures between the thorax and abdomen, and the lobster draws itself out of the rent, shedding not only the entire skin and every hair, but also the lining of the mouth, throat, and fore stomach, and likewise the end of the intestine. In about three weeks after the casting of the shell the new one becomes solid and hard. In the crayfish the old skin is loosened and pushed away from the cellular layer beneath by the growth of temporary, short stiff hairs, which disappear after the skin is shed.

The Crustacea are a very ancient type. The earliest remains are found in the Cambrian rocks, but are very scanty compared with the trilobites. They comprise traces of barnacles, *Ostracoda* or small shelled forms, *Phyllocarida*, and an obscure form supposed to be allied to the modern freshwater *Apus*. In the Devonian Period shelled phyllopods (*Estheria*) appeared, while in the Carboniferous arose an order (*Syncarida*) represented by an ancient form (*Anaspides*) still living in a lake in Tasmania. From this group the existing *Schizopoda* or "opossum shrimps" (*Mysis*), the *Squilla*, and the ordinary shrimps and crabs, are supposed to have descended. *Isopoda* also appeared as early as the Devonian. A shrimp-like Crustacean occurs in the Devonian, and true crabs date from the Jurassic.

The Crustacea are divided into 11 orders, the *Branchiopoda*, *Phyllopoda*, *Ostracoda*, *Copepoda*, *Cirrepedia* or barnacles, *Arthrostraca*, *Cumacea*, *Phyllocarida*, *Syncarida*, *Schizopoda*, *Stomatopoda*, and *Decapoda*. There are over



Fig. 1 Harvest Bug. 2 Hedgehog Tick. 3 Cheese-Mite. 4 Itch Animal. 5 Bear Animalcule. 6 Linguatulina. 7 Sea-Spider. 8 Land-Crab. 9 Frog-Crab. 10 Spider-Crab. 11 Woolly-Crab. 12 Purse-Crab. 13 Albunea. 14 Plated Lobster. 15 Spiny Lobster. 16 Crayfish. 17 Prawn. 18 Squill, or Mantis Shrimp. 19 Freshwater Shrimp. 20 Hermit Screw. 21 Caprella. 22 Isopod. 23 Wood-Louse. 24 Sphæroma. 25 Fish-Louse 26 Ione. 27 Limulus, or King-Crab. 28 Trilobite. 29 Apus, or Shield-Shrimp. 30 Water-Flea. 31 Cypris. 32 Cyclops.


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5,000 species known. See BARNACLE; CRAB; FISH LICE; HERMIT CRAB; SHRIMP.

Crutched Friars. This order appeared in England in the 13th century, and had monasteries in London, Oxford, and Reigate. From the staff which they carried in their hand, on the top of which was a cross, they received the name croisiers, which soon was corrupted into "Crouched" or "Crutched" friars. A street in London bears this name.

Cruveilhier, krü'vā'li-ā', **Jean,** French anatomist: b. Limoges 9 Feb. 1791; d. Jussac 6 March 1874. He obtained in 1835 the chair of pathological anatomy created in Paris by Dupuytren. He published an important work on 'The Pathological Anatomy of the Human Body' (1829–40), and other works.

Cruz, Juana Ines de la, hoo-ä'nä ē-nĕs' dā lä, Mexican poet: b. 12 Nov. 1651; d. 17 April 1695. Having retired from the vice-regal court at the age of 17, she became a nun of the Hieronymite order, and devoted herself to poetry, music, and mathematics, leading at the same time a life of great austerity. Her writings consist of songs, dramas (all these except two on religious themes), prologues, and dramatic sacred allegories. Her contemporaries styled her "the Tenth Muse" and "the Mexican Phœnix."

Cruz, Ramon de la, rä'mōn dā lä krooth, Spanish dramatic poet: b. Madrid 1731; d. 1799. He rescued the native Spanish drama from an inundation of French influence. A marvelously prolific writer, he produced some 300 pieces in all departments of dramatic composition; but of them all only some interludes can now command attention; these are alive in every line, reflecting with absolute truth the life of the lowest orders.

Cruz, San Juan de la, sän hoo-än' dā lä, (Saint John of the Cross), Spanish mystic and poet: b. Fontiveros, Old Castile, 1542; d. Ubeda 14 Dec. 1591. He was a Carmelite friar, canonized in 1674. His prose writings on the inner life won for him the title "The Ecstatic Doctor"; famous among them is 'The Soul's Darksome Night.' In form and spirit his poetry is noble, deep, and inspired by profound feeling. His complete 'Spiritual Works' were first published in 1619, and in a 12th edition in 1703.

Cruz y Goyeneche, Luis de la, loo-ēs' dā lä kroos-ē-gō-yā-nā'chā, Chilean military officer: b. Concepcion 25 Aug. 1768; d. near Valparaiso 14 Oct. 1828. He bore a leading part in the revolution against Spain, commanding a regiment and falling into the hands of the enemy, but was liberated in 1817. He next became a political leader of the young republic, serving for a time as acting president of Chile. He was invested by Peru with the dignity of grand marshal.

Cruzado, kroo-zā'dō, or **Crusado,** a Portuguese coin. The old cruzado or cruzado-velho was worth 400 reis, 43 cents; the new cruzado, cruzado-novo or pinto, is worth 480 reis, 52 cents.

Cryolite, krī'ō-līt (Gr. "ice-stone," in allusion to its translucent whiteness), a native fluoride of aluminum and sodium, having the formula $3NaF.AlF_3$. It crystallizes in the monoclinic system, and also occurs massive. It is transparent or translucent, and the purer varieties are colorless or white. Its lustre is vitreous, and it has a hardness of 2.5 and a specific gravity of about 3. The best-known deposit of cryolite is in West Greenland, whence large quantities of it have been taken for use in the preparation of metallic aluminum (q.v.). Less important deposits are also known in the Urals, and in El Paso County, Col. Cryolite is also used in the manufacture of alum, soda, and certain kinds of glass, notably the so-called "milk-glass," or hot-cast porcelain, which is composed of cryolite, silica, and oxide of zinc.

Cryophorus, krī-ŏf'ō-rŭs (Gr. "ice-bearing"), a simple instrument devised by Wollaston for illustrating the freezing of water by rapid evaporation. The instrument consists of a bent tube of glass, provided with a bulb at each end. A small quantity of water is placed in it, and boiled until the air is entirely expelled and replaced by steam. The tube is then hermetically sealed. In using the instrument, the water is brought into one of the bulbs, and the other, containing only water-vapor, is placed in a freezing mixture. The vapor condenses rapidly in the chilled bulb, and a correspondingly rapid evaporation is induced in the other one. The formation of vapor, however, is attended by the absorption of large quantities of heat; and the water in the free end of the apparatus, being the chief source from which this heat is obtained, presently becomes chilled to such a degree that it freezes.

Crypt, in architecture, a cell or vault constructed underground. The underground tombs of the Christian martyrs were so called, where the early Christians met to perform their devotions, for fear of persecution. Hence crypt came to signify a church underground, or the lower story of a church, which may be set apart for monumental purposes, or used as a chapel. The crypt is not common in churches built after the Norman period and when found in those of the Gothic period is usually much older than the structure above them. The usual position of a crypt is beneath the choir, but occasionally, as at Glasgow Cathedral, beneath the transept also. The largest crypt in England is that at Canterbury Cathedral. Crypts rarely occur as a feature of a parish church. The larger crypt at Glasgow Cathedral is entirely above ground and at one time was used by itself as a church.

Cryptidine, krĭp'tĭ-dĭn ($C_{11}H_{11}N$), a base homologous with quinoline, obtained in the preparation of that body, and also found in the less volatile parts of coal-tar. Its boiling-point is about 525° F., but it has not yet been prepared perfectly free from its lower homologues. It forms a double salt with platinum.

Cryptobranchidæ, krĭp to-brăn'kĭ-dē (Gr. "with hidden gills"), a family of urodele *Amphibia* (q.v.) most nearly related, according to Cope, to the *Amblystomidæ*. There are no gills in the adult, but a single pore-like branchial fissure may persist on each side. Respiration is pulmonary, but the inspirations occur only at intervals of several minutes. The vertebræ are biconcave but, like the remainder of the skeleton except the cartilaginous carpi and tarsi, are well ossified. There is no ethmoid bone, and the internal ear is separated from the brain by membrane only. A maxillary bone is developed, and teeth are borne on the margins of

both jaws, as well as on the vomers, but not on the parasphenoid. The eyes are very small and devoid of lids; two pairs of limbs with four and five digits respectively are always present, and the tail is permanently provided with a fin. Two genera are known: *Megalobatrachus*, which has no branchial opening and contains only the giant salamander of eastern Asia, and *Cryptobranchus*, which contains the American hellbenders (q.v.).

Cryptog'amous Plants, or **Cryptog'ams** (from Gr. κρυπτός, hidden + γάμος, marriage), All plants below the Phanerogams or flowering plants. The names were first used by Linnæus, who may thus have indicated his conviction that all plants possess sexuality. (They do not.) For a long time the vegetable kingdom was divided into two groups, as follows: (1) *Phanerogamia*, with stamens, ovules, seeds, and embryos. (2) *Cryptogamia*, without stamens, ovules, seeds, and embryos, and with spores. These distinctions, although long since acknowledged to be unscientific, are still maintained, especially in popular usage. The Cryptogams, instead of being a single group co-ordinate with the Phanerogams, include several such groups, namely: Water-slimes (*Protophytes*); Spore-tangles (*Phycophytes* or *Algæ*); Fruit-tangles (*Carpophytes* or *Fungi*); Mossworts (*Bryophytes*); Fernworts (*Pteridophytes*).

Cryptograms. See CIPHER WRITING.

Cryptomeria, krĭp-tō-mē'rĭ-a (Gr. "with hidden parts," its seeds being concealed in bracts), a beautiful tall-growing conifer, known also as the Japanese Cedar. The tree grows in the mountainous regions of China and Japan, and many varieties are cultivated. It was introduced into Europe in 1842, and is now widely cultivated. It is closely allied to the *Sequoia* (q.v.).

Crypturi, krĭp-tū'rī (Gr. "hidden tail," because of the rudimentary tail), an order of birds, sometimes called the *Tinami* or *Tinamiformes*, from their native name tinamou, generally regarded as *Ratitæ* (q.v.), but placed among the *Carinatæ* (q.v.) by those who regard the presence of a keeled sternum as of greater classificatory value than the desmognathous palate. Besides the characters just mentioned, which are combined in no other known birds, other remarkable osteological features are the complete union of the vomer and palatine bones, the single articular head of the quadrate, the rudimentary tail skeleton (pygostyle), the ostrich-like pelvis and legs (but not feet), and the well-developed clavicles, all but the last being ratite characters. The quill feathers of the tail are 10 or 12 in number and completely hidden beneath the coverts; the wings, which are very short and concave, have 10 primary and from 13 to 16 secondary quills; contour feathers are of the ordinary type found in flying birds, with the aftershaft rudimentary or absent. There are three long anterior toes with claws like a pheasant's, and the hallux is short and elevated, or, very rarely, absent; in fact the feet are of a strictly gallinaceous type. About 9 or 10 genera and 70 species are known, all but 6 of which are South American, occurring especially in Argentina and Brazil. See TINAMOU.

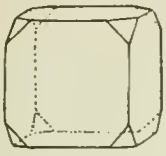
Crystal. The term crystal, derived from a Greek word signifying a hard crust, or more particularly ice, was applied by the Greeks at least 400 B.C. to a material which they supposed to be a hard, durable form of frozen water. This substance is the colorless, transparent variety of quartz still called rock crystal. The angular forms and the smooth, even surfaces of this substance were observed by the ancients, but were regarded either as accidents or as shapes "pleasing to the gods." Pliny says, "It is not easy to ascertain the reason why crystal is produced in six-sided prisms, especially since the terminations are not uniform."

By a natural association of ideas other minerals, such as beryl, diamond, garnet, and pyrite, which were observed to occur frequently in angular forms, were spoken of as crystal-like, or crystalline; the angular shapes which the alchemists obtained by evaporating different solutions were said to be the results of "crystallization," and when, toward the close of the 18th century, the study of the shapes was first systemmatically undertaken, Romé de l'Isle called the new science crystallography (q.v.). That is, the word crystal no longer meant the transparent, ice-like substance, rock crystal, but an individual solid of any substance, whether transparent or opaque, provided this solid was bounded by plane faces at definite angles, and was formed as a result of the solidification of the substance.

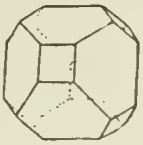
But even this third use of the term crystal does not appear to be the final one, for it rests fundamentally upon the idea of a polyhedral shape, a bounding by flat, even faces, and it is now generally admitted that external polyhedral shape is the direct consequence of a regular internal structure, and, although it is the most striking proof of this, it is often dependent upon comparatively minor conditions at the time of solidification. There is, however, a quality shown by all crystals which is also a consequence of the regular internal structure, and may be called "directional regularity"; that is, the physical characters of a crystal, such as transmission of light, the conductivity of heat, the cohesion, the elasticity, or the rate of solubility are always alike in parallel directions, and, generally speaking, unlike in directions which are not parallel. This directional regularity is shown not only by the individual plane-bounded solids called crystals, but by those much more frequent results of solidification which are of a shape determined by the space in which the solidification occurs, or may show here and there plane faces or grains with crystal outlines. Such masses are made up of individual portions, each with the same "directional regularity" as the separate so-called crystals.

The tendency now is to include all such individuals under the term crystal, one suggestion being to distinguish them as anhedral or faceless crystals, and the following definition of Fock expresses this tendency: A crystal is "a homogeneous solid body of definite chemical composition, whose physical properties are the same in parallel directions, but are generally different in directions not parallel." The outward sign is the form, but its destruction does not rob the fragments of their perfect internal structure, whereas the most perfect model is not a crystal, because it lacks the internal physical characteristics.

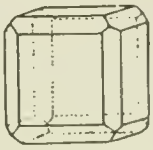
The External Form of Crystals. — Although



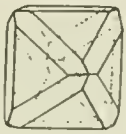
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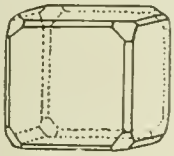
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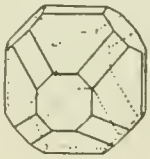
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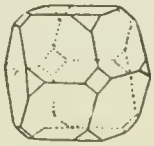
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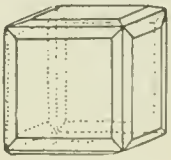
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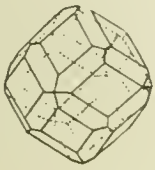
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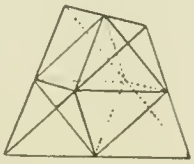
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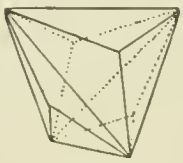
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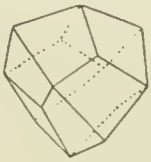
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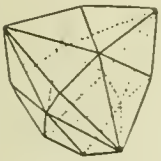
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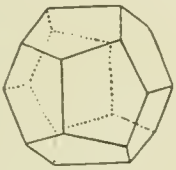
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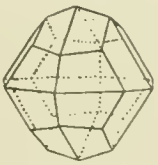
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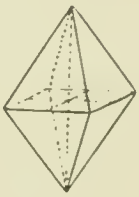
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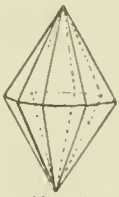
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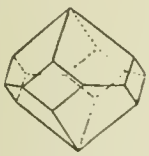
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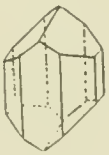
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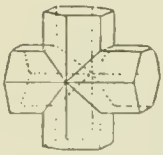


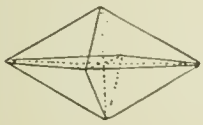


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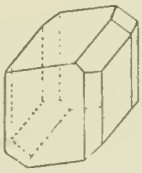


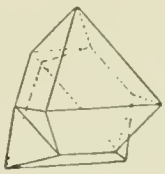




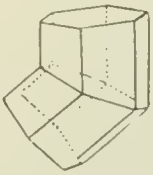


No 20





No 19



No 21.

1, 2. Combinations of Hexahedron and Octahedron.
3. Combination of Hexahedron and Dodecahedron.
4. Combination of Octahedron and Dodecahedron.
5, 6, 7, 8 and 9. Various combinations of regular systems.
10. Derivation of Tetrahedron from an Octahedron.
11. Trigonal Dodecahedron.
12. Deltohedron.
13. Hexoctahedron.
14. Pentagonal Dodecahedron.
15. Dyakisdodecahedron or Diploid.
16. Tetragonal Deuteropyramid.
17. Ditetragonal Pyramid.
18. Tetragonal Combinations.
19. Triclinic.
20. Rhombic Pyramids.
21. Twin Crystals.

some differences between the shapes of crystals of different substances had been noticed and these differences utilized in descriptions of minerals and salts, the general belief, as late as the 16th century, was that the shapes in which any one substance occurred were neither constant nor related to each other.

In 1669 Nicolas Steno, a Danish anatomist, announced that the angles between corresponding faces of different quartz crystals were constant no matter how much the crystals varied in shape. This constancy of angles was stated by Guglielmini in 1704 to be general, in that every salt had its peculiar crystals, the angles of which were constant even when the crystals were imperfect and broken.

That in addition to the constancy of angles between corresponding faces there was an intimate relation between the very different shapes often assumed by crystals of the same substance, was first shown clearly by Romé de l'Isle, who, continuing the method of Linnæus, measured and made wooden models of different crystals and in 1783 described over four hundred regular forms. As a result of his comparisons de l'Isle found that differently shaped crystals of any one substance always formed a series and that all the members of such a series could be derived by "modifying" one so-called "primitive form," the shape and angles of which varied with the substance, by particular methods, such as replacing each edge by one plane or by two planes, or each solid angle by one, three, four or six planes.

So far apparently as de l'Isle observed, the modifying or secondary planes could be at any angle, provided they were grouped in the same way at each modified edge or angle. The Abbé Haüy, however, showed that the angles made by the secondary planes were not arbitrary, but always fulfilled certain conditions. Bergman in 1773 had shown that calcite could be cleaved or broken into little six-faced fragments with constant angles and that these rhombohedral fragments could be built together again into the different observed shapes of calcite, and Haüy developed a theory to explain the relations between the observed forms by assuming that this property of "cleavage" was a general one and that all crystals were built up of "integrant molecules" of the shape of the cleavage forms. Instead of the arbitrarily chosen primitive form of de l'Isle he chose for each substance a primitive form the faces of which were parallel to directions of cleavage, or if no cleavage was found or cleavage only in one direction, he assumed a shape determined by striations or other markings or by analogy between the shapes of the crystals of other substances which did show cleavage.

The secondary forms, that is, those with faces not parallel to cleavages, Haüy found he could build by placing successive layers of integrant molecules upon the faces of the primitive form, each successive layer regularly diminishing from the subtraction of one or more rows, always some simple rational number, never to his knowledge exceeding four. This is the basis of the fundamental law of rational parameters, which, stated in general terms, is: "*That the relative positions of crystal faces are not arbitrary. If any four independent faces of a crystal are fixed then the position of any other face must fulfill certain conditions.*"

Professor Weiss of Berlin in 1809 discarded Haüy's hypothesis of decreted rows and substituted the conception of imaginary axes "around which the crystal is uniformly disposed." He divided all crystals into groups dependent upon the relative inclinations of the axes. The primitive forms of Haüy he constructed by planes intersecting all the axes or parallel to one or to two of them. If a primitive form cut three axes at distances a, b and c from the centre, then all secondary forms could be constructed by taking points along each of the axes at twice, three times and four times, etc., the lengths a, b and c, and constructing planes in the same way as before. That is, the intercepts of any secondary face in terms of a, b and c were rational, such as $2a : b : 3c$ or $a : 3b : 2c$.

Symmetry, or the repetition of equal angles or similary grouped faces, was made a crystal character by de l'Isle in his statement, "Every face has an opposite parallel face." In any de l'Isle or Haüy series each form was derived by equivalent changes of *each* similar edge or angle of the primitive form, therefore without change of symmetry, that is, "All crystals of any one substance are of the same grade of symmetry." Hessel in 1830, Gadolin in 1864, and von Lang in 1867 considered the possible varieties of symmetry of polyhedrons when limited by the law of rational parameters. Each obtained 32 types or classes.

It may be said then briefly that, with respect to external form, the crystals of any one substance will have the same symmetry, which will be one of the 32 types, that the angles between corresponding faces will be constant, and that the possible shapes will constitute a series in which the positions of the faces are not arbitrary, but fulfill certain conditions (the law of rational parameters).

Ælotropism or Directional Regularity.—The effects produced by any physical test upon a crystal vary with the direction in which the test is applied. Like effects are obtained in directions which are either parallel or geometrically similar in the crystal and, generally, unlike effects are produced in directions neither parallel nor similar.

These facts were first suggested toward the close of the 17th century by the results of the studies of calcite made by Bartholin and Huyghens, which may be summed briefly as follows: A ray of light transmitted through calcite in any direction, except one, is doubly refracted, that is, split into two rays usually following different paths. This is shown easily by the fact that an object viewed through calcite appears double. In one direction, *which is also the direction of the principal axis of geometric symmetry*, there is single refraction only, and in all directions equally inclined to this direction of single refraction the double refraction (shown by the distance apart of the images) is the same. Finally, the two rays are no longer common light, but each is "polarized," that is, each is due to vibrations in one plane, one of the two planes of polarization being a plane through the direction of single refraction, the other a plane at right angles thereto.

If polarized light, in which the vibration direction is known, is transmitted through crystals, results are obtained by which the sym-

metry of the crystals may be accurately judged. For instance, with very primitive apparatus Brewster and others obtained before 1820 the so-called "interference figures," color rings of various shapes crossed by dark bands, and Brewster was able to classify nearly all those substances to which Hauy had assigned "primitive forms," in three optical classes, one yielding no color rings or cross, another yielding circular color rings and a constant black cross, the third yielding color rings in ellipses and figures eight with a black cross which merged on revolution into hyperbolæ. Furthermore, these results were obtained in particular crystallographic directions and the distribution of color and shape of the figures were symmetrical to the planes and axes of geometric symmetry of the crystals.

A striking proof of the relation between shape and optical behavior is shown when polarized light is transmitted through quartz crystals in the direction of the prism axis. In all such crystals the emerging ray is polarized in a different plane from the entering ray, or, as it is usually stated, quartz crystals rotate the plane of polarization a definite number of degrees, dependent upon the thickness. But when crystals of quartz which show the less common faces are examined it is seen by the arrangement of these faces that there are two sorts of crystals, the faces of which are relatively like the right and left hand, and Herschel and Brewster in 1821 showed that the plane of polarization was turned to the right by the one sort of quartz crystal and to the left by the other.

A very remarkable instance of directional regularity and its connection with external form is shown by crystals in which there are different groupings of planes about the opposite ends of certain axes. These axes are not only "polar" in the sense mentioned, but when the crystal is heated, one end of the axis becomes negatively electrified and the other end positively. This fact was observed in tourmaline crystals as early as 1762 by Æpinus and the same property is shown by calamine, boracite, quartz and other minerals and always with respect to an axis which shows different grouping of planes at the two ends.

That the cohesion of crystals varies with the direction and is equally strong parallel to all geometrically equivalent directions is indicated by several characters. For instance, the directions of least cohesion are frequently shown by the "cleavage" already mentioned under Hauy's discoveries. This cleavage is always equally easy at all parts of the crystal in the same direction and also equally easy parallel to geometrically similar directions, and if cleavage exists in three or more directions the resulting cleavage form is always a simple form of the same series to which the different crystals of the substance belong and usually it is a form of frequent occurrence.

The inequality of the cohesion, except in parallel and similar directions, may also be shown by the variations in hardness and by the cracks developed by punching or pressing with a conical point, and it is especially shown in the "unbuilding" of the crystal, which takes place under the action of a solvent. Solution proceeds with different velocities in different directions in the crystal and if stopped at an early stage the crystal faces are found to be pitted by little angular cavities, the faces of which belong to forms in the same series as the crystal, and not only that but the shapes vary on different faces of the crystal and conform in this and in their shape to the symmetry of the class to which the crystal belongs.

Other characters could be instanced, elasticity, heat conductivity, electrical and magnetic characters and so on, but these are discussed more at length in the article "Physical Crystallography." All observations lead to the same conclusions, that most of the physical characters are dependent upon direction and intimately connected with the external form, or a more exact statement is that the physical characters and the external form are both results of the same cause, a "regular internal structure."

The Internal Structure of Crystals.—Although nothing is known about the shapes of the so-called crystal molecules or the forces which arrange these molecules, it is possible to consider from a purely geometric standpoint all regular arrangements of particles in space which are consistent with the law of rational parameters, using as Seeber suggested, the centres of the crystal molecules instead of the molecules themselves.

The so-called "space lattices" of Bravais, for instance, consist of points arranged in sets or parallel straight lines. In each set the points are equidistant and together they make a net-like structure in which the particles are at the corners of equal parallelopipeda. Such a structure is in conformity with the observed "directional regularity," for a line through *any* two points passes through equidistant successive points and along any parallel line through another point the interval between successive points are the same. Bravais distinguished fourteen space lattices according to the symmetry. Each conforms to the symmetry of one of the 32 classes and in each planes through any three points conform to the law of rational parameters.

Sohncke showed that a homogeneous structure still existed if two or more identical space lattices were combined, the one thrust within the other, not coincident with it, but either moved parallel to some axis or rotated 180°, 120°, 90° or 60° around this axis, or with both motions. In this way some 65 different "regular point systems" were obtained, each of which belonged to one of the 32 classes of symmetry.

In the space lattices and regular point systems all the units are orientated in the same way, that is, the corresponding faces of the different units are parallel. Curie, von Federow and Schönfliess independently showed that, corresponding to the frequent occurrences of crystal faces in pairs, like the right and left hand, other arrangements of points could be added which "faced the opposite way," that is, were like the mirror repetitions of the preceding groupings. In this way some 230 "space groups" or types of crystal structure were obtained which each had the symmetry of some one of the 32 crystal classes and which for the first time represented all these crystal classes.

THE RELATION BETWEEN CRYSTAL FORM AND CHEMICAL COMPOSITION.

Polymorphism.—A crystalline structure which conforms to all the known properties of

the crystals of a substance, represents by points the positions of equilibrium about which the movements of the so-called molecules take place. There may, however, be more than one arrangement of points which correspond to positions of equilibrium and it is therefore to be expected that temperature changes will make now one and now another of these the position of most stable equilibrium, and that the substance will therefore assume under different conditions different crystal structures and as a consequence different crystalline form and different physical characters.

This property of "polymorphism" or "physical isomerism" was first observed by Mitscherlich, who found that by slowly cooling fused sulphur monoclinic crystals were developed and that these on standing passed spontaneously, without again being fused, into the usual orthorhombic crystals. Strictly the term is limited to such homogeneous, physically different, conditions of a substance as can be attributed to differences in crystal structure and it must be distinguished from "chemical isomerism," in which the differences between two substances with the same percentage composition, are due either to the different number of atoms or the different linking of the atoms in the chemical molecule.

The distinction between polymorphism and chemical isomerism can sometimes be made by melting or dissolving the substance. In the resultant amorphous condition all differences due strictly to crystal structure disappear and, if the substance is polymorphic, crystals of both modifications should grow further on being placed in contact with the amorphous liquid mass, but when by growth they touch each other one will thereafter grow at the expense of the other. In chemical isomeres, on the contrary, fusion or solution does not destroy the differences and such a solution or fusion in contact with a crystal of each substance will usually grow only its own kind of crystal.

Polymorphism must also be distinguished from "polysymmetry" or the tendency of crystals of a substance of a certain grade of symmetry to unite to apparently simple forms of higher symmetry. For instance, substances which are orthorhombic, monoclinic or triclinic often unite to apparently hexagonal forms, and although twin lamellæ usually reveal the composite structure, at times repeated twinning may yield a structure in no way distinguishable from that of a hexagonal crystal.

In polymorphic substances the transformation from one modification to the other is usually effected by a change of temperature and is accompanied either by release or absorption of heat and the alteration of properties ceases to be a continual function of the temperature. For instance, according to Lehmann, the ordinary orthorhombic crystals of ammonium nitrate melt at about 168° C. If such a melted mass is gradually cooled there form eight-rayed skeleton crystals, isotropic in polarized light, which at 127°, suddenly become doubly refracting, increase in size and become rhombohedra. At 87° acicular orthorhombic crystals develop regularly about the rhombohedral crystals. These phenomena are obtained in reverse order if the cooled mass is reheated gradually.

Other causes than temperature changes, such as the presence of some impurity in a solution, may determine the modification formed; thus, while from a cold solution of pure calcium carbonate hexagonal calcite will separate, Credner has shown that, in the presence of an alkaline silicate, highly modified calcite crystals are deposited, but in the presence of strontium carbonate or lead carbonate only aragonite is deposited.

Morphotropism.— The question of the dependence of the crystal structure on the chemical constitution is of great interest and is studied principally by considering the changes which result in the corresponding structures of different substances of related chemical nature, by the replacement of certain atoms or atomic groups, by others. Interesting comparisons are made by *topical parameters* obtained as follows: The crystal elements α, β, γ, and a, b, c are theoretically the angles and relative lengths of the sides of the elementary parallelopipedon of the crystal structure, but the parameters $a : b : c$ of different crystals can not be used directly for comparison, because in each such proportion one term is unity and the ratio between the unities is not known. To reduce these to the same unit Beeke and Muthman assume that the volumes of the elementary parallelopipeds of crystals of different substances are to each other as the quotients of their molecular weights by their specific gravities. The shape of any elementary parallelopipedon is determined by the particular structure and therefore its parameters, the so-called "topical parameters" may be calculated, and, by comparison term by term with the topical parameters of another substance, show the differences in the structure due to the difference in chemical constitution.

By this method it has been proved that the replacement of hydrogen atoms by other atoms results in a regular alteration of crystal form and this phenomenon is called "morphotropism." Some atoms produce a larger alteration in form than others and a given atom produces a change which varies with the original compound, the larger the chemical molecule the less the influence on the form.

Isomorphism.—Certain analogous elements and atomic groups as a rule when replacing each other in a compound do not cause any radical change in the crystalline form. This special type of morphotropism is called "isomorphism" and dates from the discovery of Mitscherlich in 1819 that the phosphates of ammonium and potassium and the arsenates of ammonium and potassium occur in identical crystalline shapes. Such chemical compounds not only crystallize in identical or closely related forms, but can unite in varying proportions to form mixed crystals, each of which is homogeneous, but which vary in the proportion of the component substance and vary proportionally in their physical properties. Such "mixed" crystals are not mechanical mixtures and they differ from double salts in that the latter occur only in one proportion and their physical characters are not functions of their percentage of combination.

Crystal Growth.— Many strange views have been held as to the causes of crystallization, such as "intense cold," "divine fire," "the influence of the stars from which the six-rayed snow crystals come," "the influence of a par-

ticular salt" and "the motions of organic molecules, especially those derived from the remains of animals and plants." Even now the most definite statements that can safely be made are: that "molecular forces" are the active cause of crystallization, that when a substance solidifies under conditions which permit the free action of these forces the molecules take positions of equilibrium and crystals of some definite symmetry result, and that little is known as to the nature of these molecular forces or their mode of action.

In watching under the microscope the slow evaporation of a solution or the slow cooling of a fusion, an apparent embryonic state has been observed in which the forming solid lacks characteristic shape. Vogelsang and others have observed tiny globules called "globulites," which according to Vogelsang's theory are liquid spheroids or ellipsoids with a definite internal molecular movement, which renders them capable of mutual attraction. These group themselves in definite forms, sometimes in rows, like strings of beads, "margarites," and again in needle-like or conical forms, "longulites." From these develop "crystalloids" of characteristic shape, often doubly refracting, and so on to the complete crystal.

The theory of an embryonic period during which the forming crystal lacks characteristic shape is contradicted by the experiments of Gaubert, who instantly obtained, in certain solutions, very minute, perfectly formed crystals by suddenly diminishing the solubility by the addition of another liquid. Lehmann and others also question the need of a theory of aggregation of globulites by polar attractive forces and consider the necessary motions to be the result of diffusion or concentration currents. For instance, assuming growth to take place only in a supersaturated solution, a crystal introduced in a solution quickly impoverishes the immediate vicinity and growth ceases; but the impoverished liquid, thus becoming lighter, rises and is replaced by a new layer of saturated liquid and thus currents result.

Frequently the growth, as observed on a plate of glass on the microscope stage, is relatively rapid in one direction, suggesting a pointed rod pushing its way rapidly into the richer solution, but thickening slowly, because of the impoverished zone surrounding it. As this zone is gradually enriched by the currents, secondary offshoots form and grow in important crystal directions and these in turn send off tertiary offshoots and so on, the tendency being to the creation of skeleton outlines of crystals. As the concentration of the solution decreases the process becomes slower, the hollow places fill and the complete crystals result.

It is sometimes claimed, as showing an analogy between crystal growth and the growth of an organism, that every species of crystal has a definite limit of growth, and that when this is passed new crystal individuals are formed and the old individual grows no further. Exact measurements show that the large crystals do continue to grow, although with the larger surface the growth is less evident. Moreover, if the cooling or evaporation is made sufficiently slow no new crystals are formed, but all the material deposits on the already formed crystals.

Why a substance should vary in the occurring faces of its crystals is not understood. Rapid formation often results in simple forms and slow formation in complex forms. Foreign material in small amounts, if it crystallize with the substance, may cause the development of unusual faces and the simple presence of large amounts of foreign material may have a similar effect.

In conclusion, it may be said the study of crystals is no longer a simple study of external form, but involves questions of the highest interest to the physicist, chemist and geologist. The purely geometric portion, both as relating to varieties of regular structure and to the laws governing the association of faces in the external form, is well advanced, possibly nearly completed. But many facts remain to be explained as to origin, growth, habit, nature of molecules and molecular forces, and above all, to the relations between chemical constitution and regular structure.

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Crystal Palace, a building at Sydenham, England, about seven miles from London. The material in this building was at one time used in the Crystal Palace erected for the World's Fair which was held at Hyde Park, and was formally opened by Queen Victoria, 25 Feb. 1851. The original building was designed by Sir Joseph Paxton; the materials composing it were glass, iron, and wood. Its area was nearly 21 acres. In 1854, when the building was about to be demolished, a company formed to purchase it, tore down the original and removed the material to Sydenham in Kent, about eight miles from London. The new edifice was patterned after the World's Fair building. The grounds around the present Crystal Palace are in area about 200 acres, and are beautifully laid out. This palace was opened by Queen Victoria, 10 June 1854. The name of Crystal Palace was also given to a large building erected in 1853 in New York. The site was on Sixth Avenue, between 40th and 42d streets. It was a favorite place for large exhibitions, but in 1858 it was destroyed by fire.

Crystallography. *The General Properties of Crystals.*—If we examine a number of crystals (Figs. 19–26) we note the following characteristics. Crystals are solids bounded by flat surfaces called faces, the intersection of two faces is an edge, and the intersection of three or more faces is a quoin. The number of faces, edges, and quoins varies on different crystals but they are always so related that the number of faces plus the number of quoins is equal to the number of edges plus two. The faces not only differ in number but in shape and position. On a given crystal several kinds of faces may occur. The sum of like faces, that is, those of the same shape, on a crystal constitute a form. A form may consist of a single face or of a number of faces up to as high as 48. A crystal may consist of a single form (Figs. 3–10) or of two or more forms, when it is known as a combination (Figs. 19–26). The relative position of crystal faces may be indicated by the interfacial angle between two faces. This interfacial angle is defined by the plane angle formed by a line in each face drawn normal to the intersection-edge at the same point and is meas-

ured by means of a goniometer. Measurement of interfacial angles is the starting point for all determinations and descriptions of crystals. The recurrence of faces and angles is one of the most important properties of crystals. The kind of recurrence varies in different crystals. We also notice that the faces of crystals are arranged in belts of planes called zones with their intersection edges parallel. The faces and angles of crystals do not occur in a haphazard way but they are arranged according to certain definite laws so that on a given crystal for example certain planes may occur as faces while others can not occur. Between the faces, angles, and zones of crystals there exist exact mathematical relations. The importance of crystallography lies in the fact that a given substance (mineral or artificial salt) forms crystals characteristic of that substance and hence the crystal form may often be used in the determination of the substance.

The Symmetry of Crystals.— Symmetry or the recurrence of faces and angles in accordance with fixed laws is one of the most important properties of crystals and deserves detailed study, for it is the property which distinguishes crystals from all other substances and also distinguishes the various kinds of crystals among themselves. The several kinds of recurrence may be defined by the elements of symmetry which are plane, axis, and centre of symmetry. A solid is said to have a plane of symmetry (denoted by P) if it is divided by a plane so that one half of it is a mirror-image of the other half. A solid is said to have an axis of symmetry (A) if about any line the figure may be revolved so that it occupies the same position in space a whole number of times (n) during a complete revolution. The number of times in a revolution defines the axis of symmetry (An). A solid is said to have a centre of symmetry (C) if for every face there is another opposite and parallel to it. Figs 3 to 10 have centres of symmetry, Fig. 25 does not. Geometrical solids made of paper or wood may possess axes of any degree of symmetry, but in crystals all axes of symmetry except those of 2, 3, 4, or 6-fold are inconsistent with the law of rational indices (see later). In crystals only certain combinations of symmetry elements are possible, and there have been deduced mathematically 32 combinations of symmetry elements which characterize the 32 crystals classes. Like the periodic law of chemistry, this law foretold the existence of several crystal classes which were discovered later. To-day there are three combinations to which no known crystals belong. A crystal of a given substance always possesses the symmetry elements characteristic of that substance but no other. In natural crystals it is difficult to determine the symmetry because of distortion of the faces. On account of the vagaries of growth, the size and shape of faces are rarely as represented in ideal drawings or models but it is really the angles that count. Hence the law of constancy of interfacial angles, "in all crystals of the same substance, the angles between corresponding faces are constant." If the faces of the crystals, they intersect the sphere at its centre and radii are drawn normal to the faces of the crystals, they intersect the sphere in points which take the place of the faces and the size and shape of the faces are eliminated. Such a drawing as Fig. 1, known as a stereographic projection shows that the outer distorted crystal has an axis of 6-fold symmetry the same as the inner regular one, for their faces are both projected on the circle at 60° apart.

The Notation of Crystals.— In describing crystals something more than symmetry is

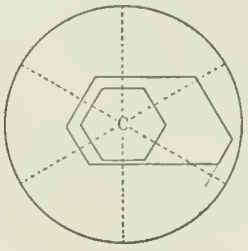


Fig. 1.

needed for there may be differences in crystals with exactly the same symmetry elements (Figs. 6 and 7). Like faces on a crystal constitute a form. There are a number of kinds of forms and they are defined by their shape. A form consisting of a single face is a pedion (plane);

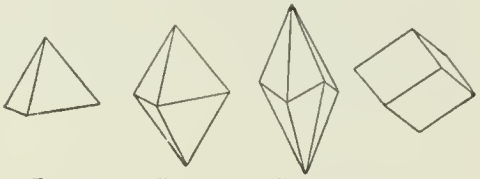


Fig. 2. Fig. 3. Fig. 4. Fig. 5.

two parallel faces, a pinacoid (table); two non-parallel faces astride a plane of symmetry, a dome (house-top); two non-parallel faces not astride a plane of symmetry, sphenoid (wedge). Prisms are forms consisting of three, four, six, eight, or 12 faces in one zone, with an axis of 3, 4, or 6-fold symmetry and are defined ac-

Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10.

cording to the cross-section as rhombic, trigonal, tetragonal, hexagonal, ditrigonal, ditetragonal, or dihexagonal. Pyramids (Fig. 2) are analogous to and named in the same way as prisms but all the faces intersect in one point; two pyramids placed end to end constitute a bipyramid (Fig. 3), defined in the same way as pyramids. Two sphenoids placed together form a bisphenoid, rhombic or tetragonal according to cross-section. A ditrigonal scalenohedron is composed of 12 scalene triangle faces, six at each end of an axis of 6-fold composite symmetry (Fig. 4), a ditetragonal scalenohedron of eight scalene triangle faces, four at each end of an axis of 4-fold composite symmetry. A rhombohedron (Fig. 5) is composed of six rhomb faces, three at each end of an axis of 6-fold composite symmetry. Trapezohedrons are forms with six, eight, or 12 faces with an axis of 3-fold, 4-fold, or 6-fold symmetry, tri-

gonal, tetragonal, and hexagonal respectively. In the isometric system there are special forms such as cube (6 faces) (Fig. 6); octahedron (8 faces) (Fig. 7); dodecahedron (12 faces) (Fig. 8); trisoctahedron (24 faces) (Fig. 9); trapezohedron (24 faces) (Fig. 10), etc. Some of these, called closed forms, enclose space, hence may occur alone, while others, open forms, can not of themselves enclose space, hence must occur with other forms. Among the closed forms are the bipyramids, bisphenoids, scalenohedrons, rhombohedrons, trapezohedrons, and the special isometric forms; all others are open forms. In order to make use of the mathematical relations of crystals the faces are defined in position by the method of analytic geometry which consists in referring all faces of a crystal to three straight lines passing through the centre of the crystal. These three lines are called axes of reference or crystallographic axes, or simply axes. The selection of these axes is arbitrary but they are always chosen so as to yield the simplest relations possible. They are therefore lines parallel to prominent edges which are usually axes of symmetry or lines normal to planes of symmetry. In Fig. 17 let OX, OY, and OZ be the three axes intersecting in O; any plane ABC is defined by its intercepts, OA, OB, and OC on these three axes, HKL is defined by its intercepts OH, OK, and OL. Now the ratios OA:OH, OB: OK, OC:OL may be expressed in simple numbers, 1, 2, 3, 4, etc., while

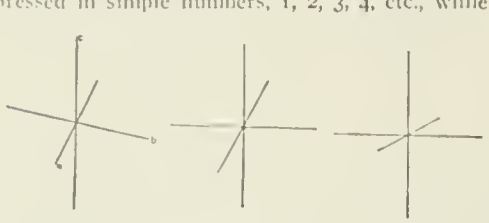


Fig. 11. Fig. 12. Fig. 13.

the ratios OA : OB : OC and OH : OK : OL are complex. So instead of the absolute values of the intercepts use is made of relative values in terms of a unit plane which intercepts the axes at assumed unit lengths. Thus if ABC is the assumed unit plane, OA = a, OB = b, OC = c, are the unit lengths of the axes. Then another plane HKL may be expressed as

$$\frac{a}{OH} : \frac{b}{OK} : \frac{c}{OL} = h : k : l,$$

in which h, k, l, are simple rational numbers such as 1, 2, 3, 4, rarely above 6. The simplest whole numbers which express the ration h, k, l are called the Miller indices of the face and are always written in the invariable order, h index on a, k index on b, and l index on c. A negative index is written $\bar{h}$. The expression hkl or (hkl) is called the symbol of the face, while $[hkl]$ is the symbol of the form of which hkl is the face. Thus there are eight planes which cut the axes at the same relative distances as HKL but on different sides of the origin O. They are hkl, $\bar{h}kl$, $h\bar{k}l$, $\bar{h}\bar{k}l$, $hk\bar{l}$, $\bar{h}k\bar{l}$, $h\bar{k}\bar{l}$, $\bar{h}\bar{k}\bar{l}$. Together they constitute the form (hkl), which is a rhombic bipyramid. Besides (hkl), which cuts all three axes, there are other faces which are parallel to some of the axes. Thus we have (Fig. 17) okl, hol, and hko, each of which cuts two of the axes but are parallel to the other axis, the o in the symbol standing for parallelism and also 001, 010, and 100 which each cut one axis and are parallel to two. These constitute the seven type symbols, hkl, okl, hol, hko, 001, 010, 100. In order to determine the type symbol it is only necessary to select the axes and write the indices in the order h, k, l, substituting a o when the face is parallel to an axis. The indices of crystal faces are usually simple numbers such as 110, 120, 011, 012, 101, 201, 111, 221, 321, etc. To determine the indices requires calculation (see



Fig. 14. Fig. 15. Fig. 16.

Calculation of Crystals). In order to have the indices as simple as possible it has been found necessary to have six kinds of axes of reference, to one of which every crystal must be referred and crystals of one substance are always referred to the same kind of axes of reference. The most general case is (1) three non-equivalent axes at oblique angles to each other (Fig. 11). Then we have (2) three non-equivalent axes, two of which are at oblique angles, the third at right angles to the other two (Fig. 12). (3) Three non-equivalent axes at right angles (Fig. 13). (4) Three axes at right angles, two of which are equivalent (Fig 14). (5) Three equivalent axes at right angles (Fig. 15). With some crystals we make use of (6) four axes, three equivalent ones in one plane at 60° to each other, perpendicular to the fourth one (Fig. 16). In the latter case the symbol is made up of four indices as 10$\bar{1}$0, $ho\bar{h}l$, $hk\bar{i}l$, etc.

The Structure of Crystals.— It is the general belief that matter is coarse-grained, not continuous. The law of rational indices is accepted

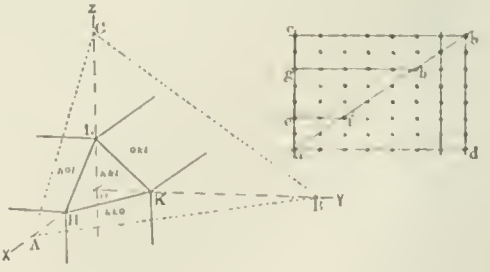


Fig. 17. Fig. 18.

as proof of some kind of molecular structure and indeed Haüy's conceptions of crystal structure probably led to his discovery of the law. In physical crystallography (q.v.) we learn that the physical properties are alike in parallel directions, which leads to the conclusion that the grouping of the molecules around each molecule is the same. So the only possible form of structure is a network or space-lattice. The varieties of space-lattices possible in crystals have been deduced mathematically by Sohncke, Schönflies, Barlow and others with the

conclusion that 230 types are possible. While we know little or nothing as to the nature of molecules we do know something as to their arrangement. If we assume a molecular network in crystals it is possible to explain symmetry, constancy of interfacial angles, rationality of indices, differences of habit, cleavage and many physical properties. Thus in a network like

Triclinic.	1	Triclinic pediad	1		$Ca_2S_2O_3.6H_2O$
	2	Triclinic pinacoidal	2	C	Axinite
Monoclinic.	3	Monoclinic sphenoidal	2	A_2	Cane sugar
	4	Monoclinic domatic	2	P	Clinohedrite
	5	Monoclinic prismatic	4	$A_2.P.C$	Gypsum
Orthorhombic.	6	Rhombic bisphenoidal	4	$3A_2$	Epsomite
	7	Rhombic pyramidal	4	$A_2.2P$	Calamine
	8	Rhombic bipyramidal	8	$3A_2.3P.C$	Barite
Tetragonal.	9	Tetragonal bisphenoidal	4	A_2	
	10	Tetragonal pyramidal	4	A_4	Wulfenite
	11	Tetragonal scalenohedral	8	$3A_2.2P$	Chalcopyrite
	12	Tetragonal trapezohedral	8	$A_4.A_2$	$NiSO_4.6H_2O$
	13	Tetragonal bipyramidal	8	$A_4.P.C$	Scheelite
	14	Ditetragonal pyramidal	8	$A_4.4P$	$AgF.H_2O$
	15	Ditetragonal bipyramidal	16	$A_4.4A_2.5P.C$	Zircon
Trigonal.	16	Trigonal pyramidal	3	A_3	$NaIO_3.H_2O$
	17	Trigonal rhombohedral	6	$A_3.C$	Phenacite
	18	Trigonal trapezohedral	6	$A_3.3A_2$	Quartz
	19	Trigonal bipyramidal	6	$A_3.P$	
	20	Ditrigonal pyramidal	6	$A_3.3P$	Tourmaline
	21	Ditrigonal scalenohedral	12	$A_3.3A_2.3P.C$	Calcite
	22	Ditrigonal bipyramidal	12	$A_3.3A_2.4P$	
Hexagonal.	23	Hexagonal pyramidal	6	A_6	Nephelite
	24	Hexagonal trapezohedral	12	$A_6.6A_2$	Cmplex tartrate
	25	Hexagonal bipyramidal	12	$A_6.P.C$	Apatite
	26	Dihexagonal pyramidal	12	$A_6.6P$	Iodyrite
	27	Dihexagonal bipyramidal	24	$A_6.6A_2.7P.C$	Beryl
Isometric.	28	Isometric tetartoidal	12	$3A_2.4A_3$	Ullmannite
	29	Isometric gyroidal	24	$6A_2.4A_3.3A_4$	Sylvite
	30	Isometric diploidal	24	$3A_2.4A_3.3P.C$	Pyrite
	31	Isometric hextetrahedral	24	$3A_2.4A_3.6P$	Tetrahedrite
	32	Isometric hexoctahedral	48	$6A_2.4A_3.3A_2.9P.C$	Galena

Fig. 18 the symmetry is apparent, (2) it is easy to see why the crystals *ghb* and *efh* have their angles *ghb* and *efh* equal, (3) all the planes that pass through the points must have rational indices, (4) a given substance may crystallize in forms like *abc* or *adbc* under different conditions for the structure is the same in each, (5) cleavage may take place in directions like *bd* more easily than in others for the distances between parallel planes are greater in these directions than in others, (6) we also see that cleavage takes place parallel to crystal faces or possible crystal faces, (7) the fact that the physical properties are alike in parallel directions is explained.

The Classes and Systems of Crystals.— Under symmetry of crystals it was found that only 32 combinations of symmetry elements are possible in crystals. These constitute the so-called *crystal classes,* to one of which every crystal belongs and no crystal belongs to more than one class. The form with the largest number of faces consistent with the symmetry of the class is the *general form* of the class and has the symbol (*hkl*). The class takes its name from the general form. The following table gives the name of the class which also includes the name of the general form and the system, the number of faces in the general form, the elements of symmetry, and a typical representative of the class, a mineral if one belongs to the class.

For convenience certain classes are grouped together according to the kinds of axes of reference which give the simplest relations. These groups are called systems, the seven systems being the triclinic, monoclinic, orthorhombic, tetragonal, isometric, hexagonal, and trigonal, corresponding respectively to the kinds of axes of reference previously given. The hexagonal and trigonal systems have the same axes of reference. By some authors they are included in one system, the hexagonal. The grouping of the classes into systems is shown in the table. The classes of a system usually have several things in common (1) similarity of symmetry elements (thus all the classes of the hexagonal system have one axis of 6-fold symmetry), (2)

some of the forms are identical, for example the cube and dodecahedron are common to each of the five classes of the isometric system, (3) the combination of certain forms of a class give rise to a form of a more symmetrical class of the same system (thus two tetrahedra (111) and ($1\bar{1}1$) of class 31 together form an octahedron of class 32). So that it is not always possible to determine the class to which a given crystal belongs. Of the 32 classes, the nine most important ones are described in detail.

Triclinic Pinacoidal Class, C.— Crystals are referred to three non-equivalent axes at oblique angles to each other (Fig. 31). The selection of the axes is arbitrary, but they are usually taken parallel to prominent edges. The axial elements are a:b:c and the axial angles α ($b \wedge c$), β ($a \wedge c$) γ ($a \wedge b$). The mathematical relations in the triclinic system are complicated. All forms, whatever the symbol, are pinacoids composed of two parallel faces. The type forms are (*hkl*), ($\bar{h}kl$), ($h\bar{k}l$), ($\bar{h}\bar{k}l$), (*hko*), ($\bar{h}ko$), (*hol*), ($\bar{h}ol$), (*okl*), ($o\bar{k}l$), (001), (010), and (100). The plagioclases (albite, oligoclase, etc.), rhodonite, cyanite, axinite, chalcanthite, and other minerals, belong to this class.

Monoclinic prism	4	hkl
Monoclinic prism	4	hko
Monoclinic prism	4	okl
Pinacoid	2	hol
Pinacoid	2	001
Pinacoid	2	010
Pinacoid	2	100

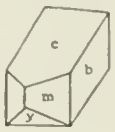


Fig. 19.

Monoclinic Prismatic Class, $A_2.P.C.$— Crystals are referred to three non-equivalent axes, two of which are at oblique angles, the third perpendicular to the plane of the other two. The axial elements are *a*:*b*:*c*, and axial angle β ($a \wedge c$). The axis of symmetry is the b-axis the selection of the other axes is arbitrary but they must be in the plane of symmetry.

Orthoclase, pyroxene, amphibole, monazite, borax, gypsum, and many other minerals belong to this class. Fig. 19 represents an orthoclase crystal with *b*(010), *c*(001), *m*(110), and *y*(201).

Orthorhombic Bipyramidal Class. $3A_2.3P.C.$ — Crystals are referred to three non-equivalent axes at right angles to each other (Fig. 20). The axial ratio is *a*:*b*:*c*. The axes of symmetry are the axes of reference.

Rhombic bipyramid	8	hkl
Rhombic prism	4	hko
Rhombic prism	4	hol
Rhombic prism	4	okl
Pinacoid	2	001
Pinacoid	2	010
Pinacoid	2	100



Fig. 20.

Sulphur, marcasite, aragonite, topaz, niter, barite, anglesite, and many other minerals belong to this class. Fig. 20 represents a topaz crystal with *m*(110), *l*(120), *c*(001), *u*(111), *i*(223), and *y*(041).

Ditetragonal Bipyramidal Class $4A_2.A_4.5P.C.$ — All crystals are referred to three axes at right angles to each other, two of which are equivalent. The 4-fold axis is the *c*-axis. The axial ratio is a:c.

Rutile, wernerite, vesuvianite, zircon, apophyllite, and a few other minerals belong to this class. Fig. 21 represents a vesuvianite crystal with *a*(100), *m*(110), and *p*(111).

Ditrigonal Scalenohedral Class $3A_2.A_3.3P.C.$ — All crystals are referred to four axes of reference, three equivalent ones of which are in one plane at 60° to each other and a fourth one normal to these (Fig. 16). The axis of 3-fold symmetry is the *c*-axis. The axial ratio is *a*:*c*.

Ditetragonal prism	16	hkl
Tetragonal bipyramid	8	hko
Tetragonal bipyramid	8	hhl
Tetragonal prism	8	hol
Tetragonal prism	4	100
Pinacoid	4	110
Ditetragonal bipyramid	2	001

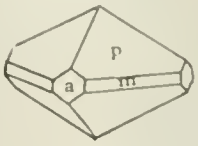


Fig. 21.

Ditrigonal scalenohedron	12	hkīl
Dihexagonal prism	6	hkī0
Rhombohedron	6	hohī
Hexagonal bipyramid	6	hh2h.l
Hexagonal prism	6	$11\bar{2}0$
Hexagonal prism	6	$10\bar{1}0$
Pinacoid	2	0001

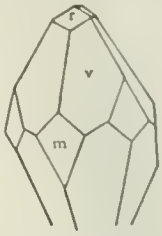


Fig. 22.

Corundum, hematite, calcite, chazabite, soda niter, and a few other minerals belong to this class. Fig. 22 represents a calcite crystal with $v(21\bar{3}1)$, $r(10\bar{1}1)$, and $m(10\bar{1}0)$.

Dihexagonal Bipyramidal Class. $A_6.6A_2.7P.C.$— All crystals are referred to same axes as in the trigonal system (Fig. 16). The axial ratio is *a*:*c*.

Dihexagonal bipyramid	24	hkīl
Dihexagonal prism	12	hkī0
Hexagonal bipyramid	12	hohīl
Hexagonal bipyramid	12	h.h.2h.l
Hexagonal prism	6	$10\bar{1}0$
Hexagonal prism	6	$11\bar{2}0$
Pinacoid	2	0001

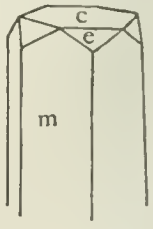


Fig. 23.

Beryl and connellite are the only two minerals that belong to this class. Fig 23 represents a beryl crystal with *c*(0001), *m*($10\bar{1}0$), and *e*($11\bar{2}1$).

Isometric Hexoctahedral Class. $6A_2.4A_3.3A_4.9P.C.$— All crystals are referred to three equivalent axes at right angles to each other (Fig. 15). Forms of this class are the most symmetrical of all crystals, and sometimes approach a spherical form. Galena, halite, fluorite, spinel, magnetite, garnet, and other minerals belong to this class. Fig. 24 represents a crystal of galena with *o*(111) and *p*(221).

Isometric Hextetrahedral Class. $3A_2.4A_3.6P.$ Crystals of this class have a tetrahedrid aspect. Diamond, sphalerite, tetrahedrite, boracite and a few other minerals belong to this class. Fig. 25 represents a crystal of tetrahedrite with *o*(111) and *n*(211).

Isometric Diploidal Class. $3A_2.4A_3.3P.C.$— Pyrite, cobaltite, sperrylite, kalinite, and a few other minerals belong to this class. Fig. 26 rep-

	Hexoctahedral		Hextetrahedral		Diploidal	
hkl	Hexoctahedron	48	Hextetrahedron	24	Diploid	24
hhl	Trisoctahedron	24	Deltohedron	12	Trisoctahedron	24
hll	Trapezohedron	24	Tristetrahedron	12	Trapezohedron	24
hko	Tetrahexahedron	24	Tetrahexahedron	24	Pyritohedron	12
111	Octahedron	8	Tetrahedron	4	Octahedron	8
110	Dodecahedron	12	Dodecahedron	12	Dodecahedron	12
100	Cube	6	Cube	6	Cube	6

resents a pyrite crystal with $e(210)$, $a(100)$, and $o(111)$.

Aggregates of Crystals.— Crystals are very frequently grouped together and this grouping may be with or without law. Irregular aggregates, where there is a haphazard arrangement of the individual crystals, are perhaps the most frequent. The regular grouping of crystals is one of two kinds. Either the edges and faces are all parallel or a part of them are parallel, that is the parallelism is either complete or partial. Aggregates with partial parallelism are called twins and are usually composed of two individual crystals united in a definite way. One individual appears to have been revolved 180° about a line called the twin-axis and the plane normal to this axis is called the twin-plane. The face of union of the two individuals, which may or may not be the twin-plane, is the composition-face. The twin-plane is a crystal face or a possible crystal face, usually one with simple indices and is never a plane of symmetry. The twin-axis is a crystal edge or is normal to a possible crystal face. The twinning law is defined by the twin-plane or twin-axis. Twins may usually be recognized by the presence of re-entrant angles or by striations, as in the plagioclases. Twins are either contact twins with definite composition-face or penetration-twins with irregular composition-face. In twins

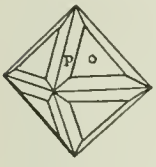


Fig. 24.

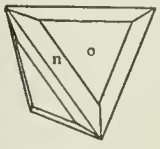


Fig. 25.

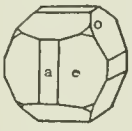


Fig. 26.

the axes of reference are parallel or inclined. Besides simple twins composed of two individuals, twins may consist of several individuals either polysynthetic or cyclic, depending upon the particular faces that serve as twinning-planes. Two or more twinning laws may be exemplified in the same crystal. The tendency of twinning is to raise the grade of symmetry. This is especially prominent in orthorhombic crystals with prism angles of about 60°. In parallel aggregates of the same mineral the individuals are usually of the same habit. But sometimes individuals of different habit are in parallel position as in calcite.

The Habit of Crystals.— Crystals are distinguished in habit as tabular, prismatic, or pyramidal according to the dominant form or prevailing shape. A particular habit often characterizes a certain mineral, for example, barite is usually tabular. Prismatic crystals of barite are so rare that when first found they were described as a new mineral. But a diversity of habit for a mineral is more usual. For example apophyllite occurs tabular, pseudo-cubic, and pyramidal. Octahedrite is either tabular or steep-pyramidal. Crystals from a certain locality may often be recognized as coming from that locality on account of the habit. Evidently a change in conditions causes a change in habit. The presence of a foreign substance is known to modify the crystal habit considerably. Alum, which ordinarily crystallizes in octahedrons, separates from an alkaline solution in cubes. The habit assumed by crystals is often such that the grade of symmetry is lowered or raised. Thus dodecahedrons of garnet according to the particular faces that are developed often simulate tetragonal, orthorhombic, or even monoclinic symmetry. An apparent raise of symmetry is perhaps more common and may result (1) by close approach in angle as in adularia, monoclinic, is often orthorhombic in habit, tetragonal sphenoids of chalcopyrite are usually difficult to distinguish from isometric tetrahedra, and also (2) by twinning as has been stated under crystal aggregates.

The Measurement of Crystals.— The starting point for all exact work in the determination of the indices, axial elements, and system of crystals is the measurement of their angles. There are two kinds of angles that can be measured, interfacial angles as BP and AP in Fig. 27, corresponding to the distance between two places on the earth's surface and coordinate angles ϕ(BCP) and ρ(CP) (Fig. 27), corresponding to the longitude and co-latitude of a place. These angles are measured by instruments called goniometers, which range from the simplest home-made device to an elaborate apparatus costing upward of $200. Interfacial angles are measured by means of one-circle goniometers; co-ordinate angles by means of two-circle goniometers. The one-circle contact or hand-goniometer is a simple apparatus consisting of two pivoted arms which allow

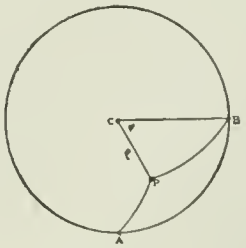


Fig. 27.

easy motion and can be clamped securely. The arms are placed so that each is normal to the intersection edge of the crystal and in close contact with the faces, the interfacial angle of which is to be measured. The arms are then clamped and applied to a graduated semicircular arc. In some cases the arms are permanently attached to the semicircle. These goniometers are usually made of brass, but a simple wooden one may easily be made from two little sticks of wood and a rivet. The hand-goniometer only suffices for fairly large crystals with even faces.

Small crystals with bright faces may be measured very exactly with the reflection goniometer, the invention of Wollaston in 1809. The modern reflection goniometer consists essentially of a graduated circle mounted horizontally on a tripod. Through the centre of the circle is an axis bearing a crystal carrier which is capable of several kinds of adjustments. The crystal is adjusted on carrier until the edge, the interfacial anlge of which is to be measured, coincides with the axis of revolution. A beam of light sent through the collimator is reflected by one of the crystal faces and an image is seen through the telescope. A reading in this position is taken and then the crystal together with the circle, is revolved until the image from the adjacent face is observed in the telescope, when another reading is made. The difference in the two readings is the supplement of the true interfacial angle, but the supplement angle for various reasons is the one usually recorded and used in calculations. Many precautions are necessary to obtain good readings. The two-circle goniometer is like the one-circle one except that a second circle which bears the crystal carrier is fixed so as to revolve always perpendicular to the horizontal circle. After adjustment of the crystal readings are obtained from each circle for each face. These two angles give the co-ordinate angles ϕ and which can be used in calculation as well as the interfacial angles. The principal advantage of the two-circle goniometer lies in the fact that only one adjustment of the crystal is necessary while with the one-circle goniometer angles are measured in zones and there must be a separate adjustment of the crystal for each zone.

The Calculation of Crystals.— In the case of described crystals it is only necessary to compare the measured with the calculated angles which are on record in the larger works on mineralogy. In the case of new forms or new minerals calculation which involves plane and spherical trigonometry is necessary. The principal steps in the calculation are (1) determination of the indices from the measured angles — in many cases the indices can be accurately determined graphically from a spherical projection (in any crystal determination it is always well to make a stereographic projection for it presents a picture of the mathematical operations involved), (2) calculation of the axial elements from graphically determined indices and measured angles in which proper weight is given to character of faces, etc., (3) calculation of theoretical angles from calculated elements and indices. This is a necessary check on the other work for the proof of the accuracy of the work lies in the closeness of agreement of the observed with the calculated angles. The calculation of crystals is much simplified by zonal relations. If a face is common to two zones its indices may be found without measurement. The indices of each zone written $[uvw]$ must be found by combining the indices of two faces of the zone hkl, and $h'k'l'$ in the following manner: $u = kl' - lk'$, $v = lh' - hl'$; $w = hk' - kh'$; $[u'v'w']$, the symbol of the other zone is also found and (pqr) the desired indices result in a similar manner. If a face (pqr) lies in a zone $[uvw]$ the following is true: $pu + qv + rw = 0$.

The Delineation of Crystals.— Crystal drawings are made for the purpose of furnishing a picture of a crystal to other persons and as an aid in crystal determination. There are two classes of crystal projection (1) those in which the faces are represented by points or lines, their size and shape being eliminated, and (2) those in which the faces are represented in their actual development. In the linear projection (Fig 28) the crystal faces are represented by lines, their intersections are zones. In the stereographic projection (Fig. 29) faces are represented by points, zones, by lines connecting these points, which are arcs of great circles. In the stereographic projection graphi-

Fig. 29.

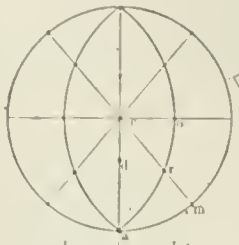
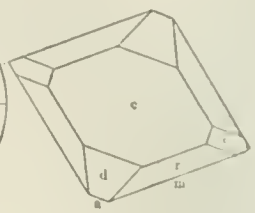


Fig. 30.



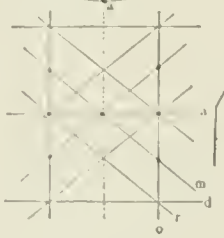


Fig. 28.

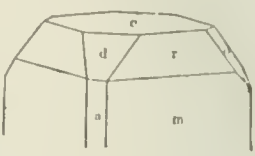


Fig. 31.

ical solutions are easily made and zonal relations are prominently brought out. To the second class of projection belong the orthographic and clinographic projections. In the orthographic projection (Fig. 30), which usually is a basal one, the plane of projection is at right angles to the visual rays. In the clinographic projection (Fig. 31) which is the one ordinarily used in descriptions and in this article the plane of projection is oblique to the visual rays, the point of sight being to the right and above the crystal, which gives the appearance of solidity. A very convenient drawing is a combination of the clinographic projection with an orthographic projection revolved about the vertical axis (Figs. 30 and 31).

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Csaba, chŏb'ŏ, Hungary, a market town near White Körös, in the county of Bekes, about 120 miles southeast of Budapest The trade is chiefly in grain, wine, hemp, flour, and cattle. It has increased greatly in volume of business and population since 1850, when it was a quiet village. Pop. (1900) 37,547.

Csoma de Körös, chō'mŏ dĕ kĕ'rish, **Alexander** (Hungarian *Sandor*), Transylvanian traveler and philologist: b. Körös, 4 April 1784;

d. Darjeeling, India, 11 April 1842. He was in early life seized by the desire to investigate the origin of the Magyar race, and after a course of study at Göttingen, he went, in 1820, to the East. He visited Egypt and Persia, and spent several years in a Buddhist monastery in Tibet, diligently studying the Tibetan language and literature; imagining he recognized resemblances between the Tibetan and Magyar. He next lived some years in Calcutta, where he compiled his 'Dictionary of Tibetan and English,' and a 'Grammar of Tibetan.'

Csongrad, chŏn'gräd, Hungary, a market town, capital of a county of the same name, at the junction of the Körös with the Theiss, 72 miles southeast of Budapest. The surrounding country is very flat, and has excellent pastures. Pop. (1900) 22,619.

Ctenoid, tĕn-oid (Gr. "comb-like"), applied to the scales of fishes when jagged or pectinated on the edge like the teeth of a comb, as in the perch, flounder, and turbot.

Ctenophora, tē-nŏf'ō-ra (Gr. "comb-bearing"), a division of the sub-kingdom *Cœlenterata*, comprising free-swimming marine animals, usually glassy and transparent, which move by means of ciliated comb-like plates. The typical form is pear-shaped or ovoid, but aberrant types, such as the ribbon-shaped Venus' Girdle, are also included in this group. All the species are hermaphrodite. They are carnivorous, and are themselves preyed upon by jelly fishes and sea-anemones. The group comprises two orders, *Tentaculata*, or those with tentacles, and *Nontentaculata*, or those, forming the family *Beroïdæ*, without tentacles.

Ctesias, tē'shĭ-as, Greek historian: fl. about 400 B.C. His writings are particularly valued for the light they throw on the history of eastern nations. He was a physician and lived for 17 years at the court of Persia, and wrote his 'History of Persia' with the view of correcting the errors prevalent among his countrymen about that country. According to Diodorus his work is derived from the official history of the Persians, written according to the law of the country. This work was written in the Ionic dialect, and contained 23 books. Of this work all that remains is an abridgment in Photius and the fragments contained in Diodorus and other historians. An edition of Ctesias, with an introductory essay on his life and writings, was published by Bähr (1824). Consult Gilmore's edition of the fragments of the 'Persika,' with notes and introduction (1889).

Ctesibius, tē-sĭb'ĭ-us, Greek mechanician. He flourished under Ptolemy Philadelphus and Euergetes, at Alexandria, about 250 B.C., and was famous for his inventions in mechanics. We owe to him and his pupil, Hero Alexandrinus, the pump, the bent siphon, and also the discovery of the elastic force of air and its application as a motive power.

Ctesiphon, tĕs'ĭ-fŏn, or **Tak-i-Kesra**, Asia, a city of Babylonia, on the east bank of the Tigris and opposite Seleucia, the common winter residence of the Parthian kings, and finally the capital of the Parthian kingdom. It was conquered by the Romans in 115 A.D., and destroyed by the Arabs under Omar in 637. Its ruins still attest its former magnificence. The two places Ctesiphon and Seleucia are known as the Arab town, El-Modein.

Cuajiniquilapa, kwä-hē-nē-kē'lä-pä, Guatemala, the chief town of the eastern department of Santa Rosa. Its altitude above the level of the sea is 3,254 feet. Pop. 3,062.

Cuautla Morelos, kwä-oot'la dä mō-rā'lōs, Mexico, the chief town of the district of Morelos, in the state of Morelos. It is about 26 miles from Cuernavaca, the capital of the state, and 85½ miles from the city of Mexico, with which it is connected by railway. The surrounding country is a fertile sugar-producing district. Cuautla is historically interesting because it occupies the site of an old Indian town; and furthermore, in the war of independence, the famous patriot leader, José Maria Morelos y Pavón, was besieged here. Pop. about 14,000.

Cuba, an island of the West Indies, separated from the United States by the Strait of Florida, and from Mexico by the Yucatan Channel, and commanding the only entrances into the Gulf of Mexico. Extending east and west from the 74th to the 85th meridian, it constitutes the most important part of the northern barrier of the Caribbean Sea, and guards the Windward Passage, the natural route for commerce between the Atlantic Ocean and the "American Mediterranean," which is equivalent to saying, if we take the larger view, that it guards the route of commerce between the Atlantic and Pacific Oceans, via the Isthmus of Panama. Its eastern point, Cape Maisi, lies directly south of New York city; its western point, Cape St. Antonio, nearly south of Cincinnati. But the total length of the island, 730 miles, is somewhat greater than that statement would indicate, for Cuba curves "like a bird's tongue," as the Spaniards used to say, from lat. 19° 40′ N. in the province of Santiago up to lat. 23° 33′ N., the most northerly provinces being those of Matanzas and Havana. In its upward curve the coast-line attains to a point that is only 96½ miles distant from Key West; thence it falls away again until but 130 miles separate it from the mainland of Mexico. Its width decreases gradually from 100 miles in the east to less than 25 near the line between the two western provinces, Pinar del Rio and Havana. Its total area, including the Isle of Pines and the *cayos* or keys (more than 1,000 islets that form an irregular border along both the northern and southern coasts) is estimated at 44,000 square miles. Thus it is larger than Virginia; smaller than Pennsylvania. Nature has provided unusual facilities for making the most of Cuba's favorable situation upon a great and permanent marine highway. The coast-line is 2,000 miles long, or much more than that if we take into account all its indentations. Capacious harbors, quite evenly distributed along the north coast, are those of Baracoa, Nipe, Gibara, Neuvitas, Sagua la Grande, Matanzas, Havana, Cabanas, and Bahia Honda; and, on the south coast, Cienfuegos, Trinidad, Manzanillo, Santiago de Cuba, and Guantanamo. Besides these there are scores of fairly safe roadsteads and harbors of moderate size. Therefore no plantation on the narrow island can be very far away from some port at which supplies may be received and from which produce may be shipped. The mountains of Cuba occur in three distinct groups. Beginning in the westernmost province,

Pinar del Rio, we find the Guaniguanico range (Sierra de los Organos; greatest altitude, 2,532 feet), extending from Cape San Antonio to the boundary line of Havana province, and thence continued in lower disconnected hills which give a bold outline to the northern coast of the four central provinces, and become the chief feature of the impressive landscapes around Sagua de Tanamo and Baracoa, far away in the east. The Guamuhaya group occupies but a limited area in the southern part of Santa Clara province, between the cities of Cienfuegos and Trinidad. Its highest summit, El Poterillo, is 2,000 feet. While the foregoing are of no great height, but owe their attractiveness rather to beauty or oddity of outline, the luxuriance of the foliage on their slopes, and the exquisite charm of the valleys they enclose, we find on the southern coast of Santiago province a range that, in sheer majesty, certainly rivals and probably surpasses any mountains of the North American continent, east of the Mississippi — the Sierra Maestra, including the Sierra del Cobre and the Macaca group. Rising precipitously above the Caribbean Sea, this cyclopean wall extends through two degrees of longitude, from Cape Cruz to the city of Santiago, in a nearly straight east and west line. The altitudes of three widely separated peaks are given as follows: The Cerro del Oro, 3,300 feet; La Gran Piedra, 5,200 feet; the Pico Turquino, 8,000 feet. From this it will be seen that all the northern parts of the island, and the southern coast as far west as Cape Cruz, are either mountainous or at least well above sea-level. But a long stretch of coast on the Caribbean Sea, especially the southern portions of Santa Clara and Matanzas provinces, is comparatively low-lying and swampy. The great Zapata swamp is formed where the gradual southern slope reaches the Caribbean level. Beyond the limits of the Zapata is an archipelago of islets, the so-called "Gardens" or "Little Gardens" (Jardinillos), crowding the shallow waters between Cuba and the Isle of Pines.

As we study the geology of these mountain groups we come upon the secret of Cuba's natural wealth — the fertility and depth of the soil that covers the pre-Tertiary sedimentary rocks forming the base of the island's structure. Above the diorites, basalts, and serpentines, the granitoid rocks, the primary and secondary sandstones, limestones, and conglomerates, is a great sheet of late Tertiary limestone. This white sheet or crust, of remarkable thickness, was formed as a deposit of "organically derived oceanic material," says Dr. Robert T. Hill; and the same authority adds: "The island was reclaimed from the sea by a great mountain-making movement in late Tertiary time, succeeding the deposition of these limestones. In later epochs, Pliocene and Pleistocene, the island underwent a series of epeirogenic subsidences and elevations which affected the coastal borders, producing the wave-cut cliffs and a margin of elevated reef rock which borders the coast in many places." About two thirds of the entire area of Cuba is covered with soils derived from this organic limestone — soils whose colors, red and black, are not at all suggestive of their origin. In quality, in depth, and in the proportion they sustain to less productive districts of the island, these calcareous soils are probably unrivaled in the world. It is quite certain that they have no rival in any land whose situation is equally favorable for easy and cheap transportation of the produce to foreign markets. A different type of soil, also valuable in agriculture, is the clay and gravel resulting from the decomposition of Tertiary igneous rocks. This occurs in parts of the provinces of Santiago de Cuba, Santa Clara, and Matanzas. Approximately one half of the island has been cleared, but between 13,000,000 and 15,000,000 acres are still covered with forests. The climate also favors vegetation, for the air is moist and injurious extremes of temperature are unknown. At Havana the thermometer averages 77° F. for the year, or 82° F. in the months of July and August, and 72° F. in December and January. At Santiago the average temperature for a year is somewhat higher — about 80° F.; on the other hand, towns located in the interior at an elevation of 200 or 300 feet above sea-level have an agreeable climate, the temperature averaging not more than 74° F. Rain falls most abundantly between the end of April and the beginning of November. The largest river is the Cauto, which flows westward through Santiago province and empties into the Gulf of Guacanayabo. Many smaller streams make their way from the mountains to both the southern and northern coasts; not a few have carved out subterranean passages through the white limestone, and thus, in ages long past, caverns of remarkable beauty have been formed. Even today in the western provinces, a number of streams disappear from view in some underground channel long before the sea is reached. In normal years nearly one half of the entire cane-sugar product of the world comes from Cuban soil, and yet the limit of the island's capacity in this direction has not been reached. As early as the 16th century the sugar industry was established under the special protection of Spanish sovereigns, but after more than 300 years have passed we find, at the beginning of the 20th century, only about 7 per cent of the area of the island devoted to the sugar crop — in other words, about 2,000,000 acres out of the total 28,000,000 acres. During the 17th and 18th centuries the annual output was about 28,000 tons. This increased to 75,000 tons in the first quarter of the 19th century, to 200,000 tons in 1840, and to nearly 300,000 tons in 1850. The increase is significant, for it was directly occasioned by the withdrawal of an annual allowance of $1,000,000 that Spain made to the Cuban administration out of the revenues from Mexico. The loss of Mexico to the Spanish crown closing that source of income, Cuba was thrown upon her own resources, with the result that she turned her attention more earnestly to the development of this profitable form of agriculture. The rapid gain in the amounts produced is shown in the following:

TABLE NO. 1. THE GOLDEN AGE OF CUBA.

Year	Tons	Year	Tons
1853	322,000	1861	466,000
1854	374,000	1862	525,000
1855	392,000	1863	507,000
1856	348,000	1864	575,000
1857	355,000	1865	620,000
1858	385,000	1866	612,000
1859	536,000	1867	597,000
1860	447,000	1868	749,000

TABLE NO. 2 PERIOD OF THE TEN YEARS' WAR.

Year	Tons	Year	Tons
1869	726,000	1871	*547,000
1870	726,000	1872	690,000

*Short crop caused by hurricanes in October, 1870.


WEST INDIES.
SCALE OF MILES.
0 50 100 150 200 250
Population of places is indicated by different lettering, thus,
100,000 and over HAVANA
15,000 to 50,000 Matanzas
5,000 to 10,000 San Juan
Smaller Places
Railroads
Cables
HAVANA and Vicinity.
GULF OF MEXICO
ENSENADA DE MARIMELENA
Morro Castle
Castillo De La Punta
Plaza De Armas
Cabo De La Cruz
GULF OF MEXICO
CUBA
HAITI
SANTO DOMINGO
PORTO RICO (U.S.)
JAMAICA (Br.)
CARIBBEAN SEA
ATLANTIC OCEAN
SOUTH AMERICA
TRINIDAD (Br.)
Gulf of Venezuela
Gulf of Paria
Yucatan Channel
Windward Passage
Mona Passage
Anegada Passage
Caicos Passage
Old Bahama Channel
Florida Straits
Nassau
Havana
Kingston
Port au Prince
Santiago de Cuba
Caracas
Maracaibo
Curaçao
Trinidad
Barbados
Martinique
Guadeloupe
Antigua
St. Thomas
St. Croix
Jamaica
Cayman Islands
Turks Islands
Bahama Islands
Andros
Abaco
Grand Bahama
Inagua
Tropic of Cancer
Sub Tel. to New York
Sub Tel. to Bermuda
Sub Tel.

Year	Tons	Year	Tons
1873	775,000	1876	590,000
1874	681,000	1877	520,000
1875	718,000	1878	533,000

TABLE NO. 3. FROM TREATY OF ZANJON TO LAST INSURRECTION.

Year	Tons	Year	Tons
1879	670,000	1888	656,719
1880	530,000	1889	560,333
1881	493,000	1890	632,368
1882	595,000	1891	816,980
1883	460,397	1892	976,960
1884	558,939	1893	815,894
1885	631,000	1894	1,054,214
1886	731,723	1895	1,004,264
1887	646,578		

The insurrection beginning in 1895 reduced the crop of the following year to 225,221 tons, and the continuance of hostilities in 1897 and 1898 forced the output of those years down to 212,051 and 300,000 tons. With the restoration of peace in 1898, a new era of development began; and though four years passed before the injuries to mills and fields could be fully repaired, the conditions at the beginning of 1903 justified the hope that the prosperity of the best years before 1896 would be regained.

In the year 1840 the output of beet-sugar for the world was but 50,000 tons, principally grown in France. From that date the production of this competing industry increased so rapidly that in 1894 it was 3,841,000 tons, and naturally this enormous addition to the world's supply caused a reduction in the price of cane-sugar which seemed ruinous, and indeed proved to be ruinous to the planters of many sugar-growing countries. But in Cuba the problem of producing sugar at a profit, despite the constant tendency toward lower prices, has always been solved with brilliant success. It was solved in the great crisis of 1884, and in more recent years whenever it has been presented. In 1902-3 improvements in agricultural methods, in machinery, and in management effected a reduction of the cost of the standard grade on some of the larger estates to much less than two cents a pound. It is evident that such results could not be achieved unless the soil and climate were in the highest degree favorable to the growth of sugar-cane; and what we have stated above is sufficient to show that large districts in which the soil is equally good have never been touched by the plow. Soil and climate are also favorable to the production of the most valuable kind of tobacco. The area in which the characteristic Cuban leaf can be grown is, however, as we shall see, much more restricted. The systematic cultivation of tobacco was not begun in Cuba until 1580, though the discovery of the use of the indigenous plant by the natives of this island dates from the first voyage of Columbus in 1492. Early in the last century the leaf grown in the Vuelta Abajo district (an area of about 90 miles in length by 10 in width, situated in the province of Pinar del Rio) won recognition the world over on account of its excellence; and as the profits of this industry, wherever it could be carried on advantageously, were much greater than those of sugar-making, no effort was spared to extend the area of production into other parts of the island. At least 10,000 tobacco plantations were in operation before the year 1880, but all experiments demonstrated the inferiority of the soil for this use outside of the Vuelta Abajo. Before the revolution of 1895, the production of leaf-tobacco in all the island was about 560,000 bales (averaging 50 kilos each) in a year. Of this amount about 200,000 bales were harvested in Pinar del Rio province, about 70,000 bales in the province of Havana, 130,000 bales in the province of Santa Clara, and 100,000 bales in the province of Santiago de Cuba. Only the 260,000 bales from the Vuelta Abajo were of the finest quality, the other components of the annual crop being known as the Partido leaf, the Remedios leaf, and the Gibara or Mayari — in the main coarser and cheaper grades. The amount of soil available for the production of first-class tobacco being thus limited, the conditions under which it had to be grown were also not at all favorable to either great or cheap production before the year 1903. First-class tobacco lands of the Vuelta Abajo were held at an exceedingly high price, and large rentals were demanded. Irrigation and constant care in most sections were absolutely necessary; efficient labor was scarce, and untrained laborers were not employed lest their blundering should ruin the product of the best fields. The following estimate generalizes the studies of a representative of the Merchants' Association of New York who made his investigations in Cuba during October and November 1902:

ESTIMATE OF COST TO PRODUCE TOBACCO IN PINAR DEL RIO, CUBA.

Lands rent for from $50 to $600 per caballeria (33.17 acres) according to distance from town and fertility of soil.

Average cost per caballeria for raising tobacco from beginning of planting until it is baled ready for market, viz.:		
Preparing land for planting, per caballeria		$ 450.00
Cost of 560 arobas of fertilizer, 7 tons at $60		420.00
Cost of 561,000 tobacco plants, at $2.50 per M.		1,402.50
Labor of planting and distributing fertilizer		165.00
Caring for the plants three months		1,982.00
Cutting and carting to dry house		644.00
Piling the tobacco		40.00
Gathering the seed to produce 1 caballeria		50.00
Depreciation of material and unforeseen expenses		300.00
Expenses for selecting and binding material, and baling, estimating 211 bales per caballeria		1,688.00
Total		$7,141.50
The product is calculated as follows:		
Value of 211 bales, at $50	$10,550	
" " 54 arrobas of seed at $4	216	
" " sticks of tobacco which are sold for fertilizing	12	10,778.00
Profit		$3,636.50

This computation should be regarded as very moderate. One of the leading manufacturers of Havana prepared an estimate for this publication which showed the cost of production in the San Luis district,— perhaps the best part of the Vuelta Abajo,— to be $15,802 for 260 bales of tobacco, the product of one caballeria of land. Avoiding extremes, we may say that the average cost per caballeria in that portion of the island was shown to be between $8,000 and $9,000; and the conclusion is that the production of tobacco in Cuba before 1903 was much more expensive than in any other part of the world. For this reason, and in view of the failure to secure good results outside of a few small districts, it appeared that the tobacco industry was destined, as compared with the cultivation of sugar, to play a secondary role, though still an important one, in the commercial development of Cuba. During seasons of

moderate prosperity it had furnished employment for about 80,000 persons. The value of that part of the product exported to the United States alone, before the insurgents had laid waste the Vuelta Abajo and Partido districts, was as follows: In 1888, $7,041,516; in 1889, $9,201,431; in 1890, $11,088,240; in 1891, $10,484,604; in 1892 $10,852,600; in 1893, $11,727,088; in 1894, $7,881,408; in 1895, $9,311,980; in 1896, $12,707,352.

The transfer in 1902–3 of large interests to American capitalists led to the introduction of modern labor-saving devices and economical methods. Formerly growers made the mistake of collecting seeds from inferior third-growth plants, and the result was seen in a gradual degeneration of the plants and diminution of their leaves. To check this degeneration, strong fertilizers had occasionally been used in such large quantities that the leaves, while regaining their lost size, lost much of their fine quality. This was done even after it became a matter of common knowledge that the crops could be improved by scientific selection of seeds. For work in the fields, antiquated wooden plows were still used in 1902; and the tobacco land was cultivated in small farms, an arrangement that seemed necessary to those who employed only the primitive methods of destroying insects and ignored the spraying machine. So long as the old methods prevailed, a native family could not take care of more than a small field; moreover, the labor of the entire family was required, for work went on day and night. Every leaf had to be examined frequently and kept free from tobacco caterpillars. The wife and children aided the adult male laborer, taking turns throughout the 24 hours. In such details as these, improvements were made by the new management, not without opposition. The early attempts to introduce reforms in the established methods of handling the leaf in the manufactories was one cause of the strike of operatives and the riots in Havana (November 1902). Up to the close of the year last mentioned it was supposed that the soil of Pinar del Rio province was unique, both with respect to the rest of Cuba and all other countries as well. But the report of the secretary of agriculture of the United States, published 4 Dec. 1902, contained the announcement that in eastern Texas tobacco had been grown, under the direction of experts of the Department, which could "not be distinguished from the imported Cuban." The Department's representatives made their successful experiments or observations in Texas at Willis, Woodville, Nacogdoches, and Liberty. The area thus roughly defined is larger than all of the tobacco districts of Cuba.

Natural Resources.—In the mountainous eastern province deposits of copper, iron, manganese, and lead exist, and some of the mines have been worked on an extensive scale. The copper mines at Cobre, near the city of Santiago, were opened in 1524, and ranked as the greatest copper mines in the world until the deposits of this metal in the United States were developed. Iron ore of excellent quality outcrops on the southern slope of the Sierra Maestra range, and several companies operate mines east of Santiago which, together, have produced nearly half a million tons of iron in the best years. Deposits of silver have been found in the provinces of Puerto Principe, Santiago, and Santa Clara, and every province contains mines of asphaltum. Cedar, mahogany, pine, lignumvitæ, ebony, rosewood, logwood, and other dyewoods, are valuable products of the forests for export; for the use of the Cubans themselves the royal palm stands unrivaled. Besides these well-known varieties, there are many less familiar trees — not only the characteristic flora of the other West Indian islands, of Central America, and Florida, but plant-forms that developed quite distinctive characteristics in the depths of these forests whose borders only were touched by the inexpert native lumberman. More than 3,350 native plants were catalogued before an exhaustive study of the subject could be undertaken. All kinds of tropical fruits grow luxuriantly, many of them without cultivation. In point of value the banana heads the list. Cocoanuts, oranges, lemons, limes, and pineapples are grown for shipment in larger or smaller quantities to correspond with the demand in foreign markets, the supply being practically unlimited within a short time after the demand becomes known. The anon, mango, rose-apple, pomegranate, sapote, tamarind, fig, citron, guava, aguacate (alligator pear), mamey, guanabana, etc., are abundant. The cultivation of grapes was forbidden by the Spaniards in the interest of the wine merchants of the Peninsula. No intelligent effort to realize the island's possibilities in this direction has yet been made, though in the year 1893 the value of fruit and vegetables exported to the United States from Cuba was $2,464,191. Coffee culture was at one time a flourishing industry; and since the comparatively small amount still grown in the eastern end of the island is of excellent quality we may expect coffee-raising to prove one of the minor sources of wealth in the future. Cotton grows freely in Cuba. Its cultivation on a commercial scale, abandoned after the liberation of the slaves, was resumed experimentally in the province of Santiago in 1902–3. In all parts of the island grasses grow rankly, and forage is abundant throughout the year. Other conditions favorable to cattle-raising are the mildness of the winters, the streams of fresh water, and the ready access to important markets on the Atlantic coast. Before the insurrection there were two and one half millions of cattle in Cuba; at its conclusion not more than 75,000. The promotion of this industry was encouraged by the Palma administration in 1902–3, and undertaken largely by American capitalists.

Population.—The first census of Cuba was taken in 1774, and we are enabled to trace the growth of population from that date onward. A study of the figures given below shows a decrease of 12.09 per cent in 1810, of 1.47 per cent in 1827, of 10.80 per cent in 1846, and of 1.80 per cent in 1869:

Year.	Pop.	Year.	Pop.
1774	171,620	1841	1,007,625
1787	176,167	1846	898,754
1792	273,939	1865	1,044,185
1804	432,000	1867	1,426,475
1810	600,000	1869	1,399,811
1817	635,694	1874	1,446,372
1819	553,033	1877	1,521,684
1825	715,000	1887	1,631,687
1827	704,487	1903 (est.)	1,590,000
183	755,695		

As more than 200,000 people were killed or died of starvation and disease during the insurrection of 1895–8, we must assume that the

population increased more rapidly during the eight years before that outbreak than at any other period in the island's history. The natural increment, if we base our calculation upon the United States census rates, excluding the gain through immigration, would have given Cuba a population of considerably more than 5,000,000 in 1903. Destructive wars and oppressive laws account for the difference in part but not wholly. The black or colored element has shown from the first a marked tendency to decline in numbers. Over 1,000,000 African slaves were imported, but the census of 31 Dec. 1887 showed only 528,798 colored persons and 1,102,889 whites, the percentage being 67.59 for whites and 32.41 for colored people, the latter comprising Asiatics as well as negroes. The census of 1877 placed the number of Asiatics at 43,811. We must remember, also, that a large number of the colored people of Cuba, are descendants of the negroes who accompanied the 16th century Spanish explorers and earliest settlers. The Chinese who were brought to the island under contract to work on the sugar plantations have drifted into other occupations, such as market-gardening. The white inhabitants are not all known as Cubans, but are divided into two classes, Cubans and Spaniards — the latter being identified by birth and sympathies with the mother country. In both classes we find some persons of good character and excellent ability. More than elsewhere the custom has been for members of the wealthier families to receive their education abroad; and whereas they were formerly in many instances sent to France, England, or Germany for educational purposes, in recent years, and especially since 1901, the schools of the United States have been almost invariably preferred. The peasants also form a class that deserves a somewhat better reputation than it bears in the world at large. Revolutions and destruction of property were induced by intolerable oppression; it is not true that the natives are more lawless than are the ignorant classes in other countries; and instead of being hopelessly slothful, as travelers have commonly represented them, they are capable of doing fairly good work under proper direction. Between the extremes of wealth and poverty is the class that is most corrupt and least useful; in the structure of Cuban society a student does not find the vigorous and substantial middle class known to Anglo-Saxon and Tentonic communities.

Cities and Towns.— Each of the six provinces has the same name as its capital city. The most populous of the provinces, Havana, with an area of 8,610 square miles and about 436,000 inhabitants, represents the tendency of manufacturing districts to mass their people in a few centres. The city of Havana alone had a population of 235,981 when the government of intervention took its census, and immigration increased that number to more than 247,000 in the next four years. Contrast with this the agricultural province of Pinar del Rio, of which the capital is a town of less than 9,000 inhabitants. Matanzas, capital of the province of that name, is not only important commercially,— its shipments of sugar to the United States having been in value about $60,000,000 in the five years before the late war,— but it is interesting to tourists in search of the picturesque because it adjoins the valley of Yumuri, Cuba's earthly paradise, and the famous caves of Bellamar. Santa Clara (popularly known as Villa Clara), high above sea-level in the centre of its province, is surrounded by a fine grazing country, and both silver and asphaltum are found in its neighborhood. Puerto Principe, a "port" that is 35 miles from the north coast and 45 miles from the south, was the centre of a prosperous grazing district before its cattle were destroyed. Of all the provincial capitals the most famous is that one which the natives call simply "Cuba," and Americans call Santiago — Santiago de Cuba, the second oldest town, formerly the capital of the island, the metropolis of the Roman Catholic Church in Cuba, and the theatre of the main events of the Spanish-American war of 1898. Its safe harbor; its situation, as the natural outlet for the important mining and agricultural industries of the province; even more, its proximity to the Windward Passage, assure the future development of this city. Besides these capitals there are 109 cities and towns in the island that have a population of more than 200: Cienfuegos (see that title), Guanabacoa, Cardenas, Trinidad, Sancti Spiritus (Santo Espiritu), Sagua, Regla, Manzanillo, Guantanamo, ranging from 30,000 to 8,000; and 100 smaller places, some of which are quite important commercially. On the Isle of Pines (area 840 square miles, population about 3,000) there are two small towns, Nueva Gerona and Santa Fé, connected by steamers with Batabano, on the south coast of Havana province. Both lie in an attractive though somewhat inaccessible region, renowned for its excellent climate and products, such as marble and hardwoods. In the past the Isle of Pines was administered as part of the judicial district of Bejucal (province of Havana); but the official declaration of transfer of the government and control of Cuba to the President and Congress of that republic put the ownership of the smaller island in doubt. The following reservation was made: "It is understood by the United States that the present government of the Isle of Pines will continue as a *de facto* government, pending the settlement of the title to said island by treaty pursuant to the Cuban constitution and the act of Congress of the United States approved 2 March 1902." This reservation or condition was accepted by the Cuban president.

History.— A score of years after the discovery, the town of Baracoa was founded by Spaniards under the leadership of Velasquez; next, in rapid succession, came Trinidad, Sancti Spiritus, Puerto Principe, and Santiago, dating from 1514 to 1515. In the year last mentioned Velasquez founded the original town of Havana (San Cristóbal de la Habana) on the south coast; but in 1519 the present site on the north coast was chosen, and to it the settlers of the older town were transferred. So important did this new Havana appear to be that the first governor of Cuba called it "The Key of the New World." Burnt by the buccaneers in 1528, it was rebuilt and surrounded with fortifications by De Soto. Again captured and sacked by pirates in 1556, it was again fortified, and more strongly, by direction of the Spanish crown. Morro Castle was begun before 1600. During the 16th century the value of Cuba in Spanish eyes was precisely what the words "Key of the New World" expressed: at its ports expeditions were fitted out for conquest and exploration of the main-

land. But there was no thought of obtaining [illegible] except by the discovery of the precious metals, the futile search for which was never quite abandoned. When the first plants of sugarcane were imported from the Canary Islands to start an industry more remunerative than mining, it became necessary to import slave labor from Africa also. The Indians had been nearly exterminated — not entirely so, as is commonly asserted, for the aboriginal strain can still be detected in the physiognomy of some Cubans. English, French, and Dutch pirates continued to ravage the coasts during the next century. Cuban cities of that time, with their old fashioned defensive works, were like the walled towns of mediæval Europe. An attack of the Dutch fleet upon the capital was repulsed in 1628; in 1702, however, a force of English and American colonial troops, under Lord Albemarle, took Havana, which they held until, by the terms of the treaty of Paris of 1763, Spain regained possession. A period of moderate prosperity and exceptionally good government followed. Las Casas, who came out as captain-general in 1790, worked earnestly and wisely to promote Cuba's interests; the Cubans, for their part, evinced their appreciation of such considerate treatment by a chivalrous display in Spain's time of need. Havana learned in 1808 that the Spanish dynasty had been overthrown by Napoleon; thereupon her citizens declared war against Napoleon. And when Spain was losing one after another of her American colonies, Cuba remained loyal. But prosperity,— the brilliant achievements in agriculture to which we have already referred,—brought long years of suffering to the "ever-faithful island" and the mother country as well. The result was inevitable. When the long-sought treasures of Cuba were at last brought forth, not from gold mines but from the fertile soil, Spain sought to make the treasure all her own, as she had monopolized the precious metals three centuries before. With a few noble exceptions, the high Spanish officials sent to Cuba were simply belated *conquistadores*, lacking the personal valor, but possessing the acquisitive talent of the adventurers who first exploited Mexico and Peru. The decree of 1825 placed the lives and fortunes of all Cubans at the disposal of the captains-general. Conspiracies, insurrections, filibustering expeditions from the United States, called forth by oppressive measures, and in turn furnishing a pretext for multification of repressive measures,— are the main incidents of the story of the 70 years next following. We may mention only the conspiracy of 1829, the rising of the blacks in 1844, the Lopez expeditions in 1849, 1850, and 1851, the revolts in 1855, the Ten Years' war (1868-78) and the revolution of 1895. About 200 Americans took part in the ill-starred expedition of 1851, and of those who surrendered after Lopez's defeat many were shot. Capt.-Gen. Tacon (1836) set native Cubans against resident Spaniards by harsh discrimination, persecuting the former and favoring the latter, thus intensifying that antagonism between the two elements of the white population which to-day makes political controversies rancorous. The cause of the revolutionary movements between 1849 and 1855 was the cruelty of a military commission in 1848, more than 3,000 persons being tortured, imprisoned, banished, or executed at that time for real or supposed complicity in a plot. During a part, at least, of the Ten Years' war, the aim of the Spaniards was, as Capt.-Gen. Valamaseda wrote, to convert the island into a desert. Spain sent 257,000 men against the insurgents and lost 208,000 of them, according to official reports; the Cubans lost 40,000 persons, men, women, and children; the cost of the war, excluding the value of property destroyed, was $300,000,000. Midway in this struggle the Virginius, a vessel whose American register had been fraudulently obtained, was captured by a Spanish warship, taken into the harbor of Santiago, and about 50 of her officers and men were shot without civil trial. The Treaty of Zanjon (1878), while apparently making concessions, restored in effect the old oppressive conditions. The cost of the war was made a new burden for the island to bear, while vexatious restrictions hampered its commercial relations with other countries. "Underground Cuba" gathered force for a final effort; in February 1895, a little flame of insurrection was kindled; in the course of three years the whole island was again laid waste. Throughout the last century the government of the United States manifested an interest in Cuba's fate. In 1823, Mr. Monroe being President, a despatch was sent by the secretary of state to the American minister at Madrid, in which the secretary (Mr. Adams) called particular attention to the commanding position which Cuba occupies with reference to the Gulf of Mexico and the Caribbean Sea, and expressed the opinion that there was no other foreign territory which could compare with it in the sum of the national interests of the United States. In 1825 and 1826 Colombia, being then at war with Spain and designing to invade Cuba and Porto Rico, refrained from this projected attack on the strength of a protest from the United States — a protest in the interests of the slave-power; the new Spanish-American states "always marched under the standard of universal emancipation." Martin Van Buren said in 1829: "It is the interest of the southern section of the Union that no attempt should be made in Cuba to throw off the yoke of Spanish dependence." Webster, in 1848, declared that Cuban emancipation "would strike a death blow at the existence of slavery in the United States." Thus for 20 years the southern slave-owners insisted that the status of Cuba and Porto Rico should not be changed.

The annexation idea came to the front in 1848. A proposition for the purchase of the island was made by President Polk, through his secretary of state, Mr. Buchanan, who wrote to the American minister authorizing the latter to offer $100,000,000 to Spain as compensation for the surrender of a colony which was, as we have seen, a particularly troublesome possession just then. The strategic value of Cuba was dwelt upon in this correspondence, and the fear was expressed that the island might fall into Great Britain's hands, in which event that nation would exercise supreme control over the Gulf of Mexico. The offer was declined by Spain. Both England and France were warned in 1852 that the United States would not admit the claim of any other power to intervene in a dispute of which Cuba was the subject. In February 1854 the cargo of an American steamer, the Black Warrior, was



LAST DAY OF AMERICAN OCCUPATION IN CUBA.

seized unjustifiably in Havana. It seemed for a time that war, and the acquisition of Cuba by force, might ensue; but reparation was offered by Spain, and was accepted. President Grant intimated in 1875 that "mediation and intervention" might become necessary to put an end to the long struggle then in progress.

The revolution of 1895 falls naturally into three periods: First, that of Capt.-Gen. Martinez Campos, whose fair fighting utterly failed to prevent the spread of the revolutionary movement from the eastern to the western provinces; second, that of Capt.-Gen. Weyler, who inaugurated the shameless policy of reconcentration; third, that of Capt.-Gen. Blanco — including the events from Weyler's recall to the destruction of the Maine. Fighting fairly and like a gentleman, Campos was fairly beaten by men who developed positive genius in guerrilla warfare — Gomez and Antonio Maceo, who knew how to win by skilful evasion, by opportune attack, and, above all, by making an ally of every peasant and living on the country. Maceo crossed both trochas, and reached Pinar del Rio province, thus carrying revolt from one end of the island to the other. Among the hills of the Sierra de los Organos he maintained his band of followers and defied all efforts to dislodge him up to the close of the year 1896. Then he risked his life once too often, and was killed. Campos failing to check the insurrection, Weyler was sent to crush it. The reasoning of the latter was strictly logical. He learned that Cuban peasants supplied the rebels with food, with information in regard to the movements of Spanish columns, and with ammunition — bought, stolen, or brought to the coast by filibusters; he did not shrink, then, from the extreme cruelty involved in the removal of the country folk from their homes to garrisoned cities, where, as "reconcentrados," they should become quite harmless. On 21 Oct. 1896, his infamous proclamation was issued. Thousands of Cuban families were pent in towns or zones under surveillance of a Spanish garrison; and as time went on they died of starvation and fever.

When Spain's prime minister, Señor Cánovas del Castillo, was assassinated, 8 Aug. 1897, the prop of Weyler's Cuban policy was withdrawn. His successor, Gen. Blanco, took to Cuba a policy of compromise. Autonomy was offered; and, for the rescue of the reconcentrados, the suggestion was made that charitable people in the United States might forward supplies to be distributed by the American consuls in Cuba. The proposal of autonomy was rejected with emphasis: Gen. Blanco's emissary who brought the message was shot by an insurgent commander. And when it became known that an appeal for contributions to feed starving Cuba had been made in the United States, formidable riots in Havana expressed resentment of the proffered relief, which was regarded as the entering wedge of the dreaded intervention. For the protection of American interests the Atlantic squadron was ordered to make its headquarters at the Dry Tortugas, within six hours' sail from the Cuban capital; and on 25 January the battleship Maine was sent to Havana harbor. The Spanish government sent the cruiser Vizcaya to New York harbor soon afterward. On 9 Feb. 1898, a letter addressed to Señor Canelejas by Señor Dupuy de Lome, Spanish minister to the United States, was published in the newspapers of the latter country. Its cynical tone and insulting characterization of President McKinley were resented, and Señor de Lome resigned his office. One week later the Maine was destroyed "by the explosion of a submarine mine,"— to quote from the report of the court of inquiry,— "which caused the partial explosion of two or more of her forward magazines." The court was unable to obtain evidence fixing the responsibility upon any person or persons; before the official investigation was made, however, public opinion in the United States had rightly or wrongly assigned the responsibility, and war with Spain seemed inevitable. On 8 March, the House of Representatives passed a bill appropriating $50,000,000 for national defense. Senator Redfield Proctor's statement of his personal observations in Cuba, read to the Senate 17 March, did not make for peace: it confirmed previous reports which had excited pity and indignation. Diplomatic representatives of the six great European powers called at the White House 7 April to present a joint note, a "pressing appeal" for "the maintenance of peace." President McKinley's reply was conciliatory, but the resolve he had formed was expressed in his message of 11 April: "In the name of humanity, in the name of civilization, in behalf of endangered American interests, which give us the right and the duty to speak and act, the war in Cuba must stop." The war in Cuba had, indeed, stopped or halted. The queen regent of Spain had directed Gen. Blanco to proclaim a suspension of hostilities, in order to prepare and facilitate the restoration of peace; and the President's message concluded with the statement that he had received official information of this circumstance. The text of Gen. Blanco's proclamation had been published, and the orders of Gen. Weyler revoked. It was asserted that the reconcentrados were to be permitted to return to their homes, that the sum of $600,000 had been voted for their relief, and that public works had been undertaken for the purpose of giving employment to the poor. Spain had offered to submit to arbitration the disputes which might arise in the matter of the Maine. President McKinley called attention to all these things, and requested that they should be given full weight in the deliberations of Congress. But the "full weight" of such programmes had been ascertained. The reports of American consuls in Cuba accompanying the message described conditions which it seemed impossible to reform without forcible intervention. The famous joint resolutions of 19 April, recognizing "the independence of the people of Cuba, demanding that the government of Spain relinquish its authority and government in the island of Cuba, and withdraw its land and naval forces from Cuba and Cuban waters, and directing the President of the United States to use the land and naval forces of the United States to carry these resolutions into effect," concluded with the words: "The United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction, or control over said island, except for the pacification thereof, and asserts its determination when that is accomplished to leave the government and control of the island to its people."

The Spanish-American war began on 21 April 1898. A naval engagement that was destroyed off Santiago 3 July; the formal surrender of Santiago took place on 17 July.* See United States, Spanish-American War. By the protocol of the ending hostilities which was signed 12 Aug. 1898, it was provided that Spain should relinquish all claim of sovereignty over and title to Cuba, and that Cuba should be immediately evacuated. The evacuation proceeded gradually, the last of the Spanish troops leaving 1 Jan. 1899. The participation of the revolutionary army in these events has two noteworthy features: A force of about 3,000 Cubans, led by Gen. Calixto García, joined the American troops at Aserraderos and served through the Santiago campaign, forming a part of the line about the city. Later, the retiring Spanish army was closely followed, outside of the chief cities, by the Cuban army, which took charge of the towns and country, maintaining order and performing police duty; and, when finally disbanded, dispersing peacefully among the people. The treaty of Paris, signed 10 Dec. 1898, provided for the temporary occupation of the island by the United States. By an order dated at Headquarters of the Army, Washington, 13 Dec. 1898, a division known as the Division of Cuba was created, under command of Maj.-Gen. John R. Brooke. The authority of military governor of the island was exercised by Gen. Brooke from 28 Dec. 1898, until 20 Dec. 1899, when he was succeeded by Maj.-Gen. Leonard Wood, who continued in office until 20 May 1902. During the entire period of American occupation (18 July 1898 to 20 May 1902), the total revenues were $57,107,140.80; amount in hands of the treasurer at the close of business, 19 May 1902, $935,170.20. The latter sum was paid to the Republic of Cuba; the former was expended for maintenance of the government ($2,780,781.16), justice and public instruction ($11,108,187.40), sanitation ($9,706,258.20), public buildings, works, ports, and harbors ($5,833,607.90), charities and hospitals ($4,124,089.60), barracks and quarters ($2,525,483.78), etc. A comparatively small amount was used for the pay of officers and men; very large sums devoted to works of public utility, in the interests of the Cuban people. Cuban imports during this period amounted to $225,437,135, the largest items being food tuffs, animals, and animal products, cotton, silk, vegetable fibres, wool, etc., and metals and metal manufactures. From the United States came 43 per cent of imports, while the rest of the world supplied 57 per cent. Cuban exports amounted to $180,669,067, the United States taking 75 per cent. The articles exported to the United States were tobacco and its manufactures, $45,400,670; sugar and molasses, $77,048,819; wood, unmanufactured, $1,752,451; iron and manganese ore, $2,587,715; fruits and nuts, $2,547,392; all other articles, $5,470,602. Thorough sanitary measures were adopted; the death-rate of the island was lowered; the causes of yellow fever were discovered, and that disease nearly exterminated. Especially successful were the efforts to beautify Havana and improve its sanitary condition; that city became one of the most attractive in Latin America. The reforms extended to the prisons, hospitals, and asylums; a general system of free schools was established throughout the island, in many practical ways Cuba was prepared for self government.

A constitutional convention, the members of which were elected 15 Sept. 1900, met in the city of Havana the following November. The Constitution of Cuba was adopted 21 Feb. 1901, and an appendix thereto (the "Platt Amendment") 12 June 1901. A form of government was thus provided which, in its main features, resembled that of the United States. The appendix, however, curtails Cuban independence. Its eight articles follow:

I. The Government of Cuba shall never enter into any treaty or other compact with any foreign power or powers which will impair or tend to impair the independence of Cuba, nor in any way authorize or permit any foreign power or powers to obtain by colonization or for naval or military purposes, or otherwise, lodgment or control over any portion of said island.

II. That said Government shall not assume or contract any public debt to pay the interest upon which, and to make reasonable sinking-fund provision for the ultimate discharge of which the ordinary revenues of the Island of Cuba, after defraying the current expenses of the Government, shall be inadequate.

III. That the Government of Cuba consents that the United States may exercise the right to intervene for the preservation of Cuban independence, the maintenance of a government adequate for the protection of life, property, and individual liberty, and for discharging the obligations with respect to Cuba imposed by the Treaty of Paris on the United States, now to be assumed and undertaken by the Government of Cuba.

IV. That all the acts of the United States in Cuba during the military occupancy of said island shall be ratified and held as valid, and all rights legally acquired by virtue of said acts shall be maintained and protected.

V. That the Government of Cuba will execute, and, as far as necessary, extend the plans already devised, or other plans to be mutually agreed upon, for the sanitation of the cities of the island, to the end that a recurrence of epidemic and infectious diseases may be prevented, thereby assuring protection to the people and commerce of Cuba, as well as to the commerce of the Southern ports of the United States and the people residing therein.

VI. The Island of Pines shall be omitted from the boundaries of Cuba specified in the Constitution, the title of ownership thereof being left to future adjustment by treaty.

VII. To enable the United States to maintain the independence of Cuba, and to protect the people thereof, as well as for its own defense, the Cuban Government will sell or lease to the United States the lands necessary for coaling or naval stations, at certain specified points, to be agreed upon with the President of the United States.

VIII. The Government of Cuba will embody the foregoing provisions in a permanent treaty with the United States.

The convention adopted the foregoing articles reluctantly, after considerable delay, and relying upon representations made to certain delegates by President McKinley, Senator Platt, and other officials at Washington, that the tariff on Cuban products sent to the United States would be reduced, as a proper concession in view of the surrender by Cuba of such valuable privileges. The Congress of Cuba (elected 31 Dec. 1901 and 24 Feb. 1902) was convened in Havana 5 May 1902, to examine into the credentials of its own members, and to count and ratify the electoral vote.

At 12 o'clock, noon, 20 May 1902, the Republic of Cuba was established; Tomás Estrada Palma being president, and Luis Estevez Romero vice-president. The transfer was made in the reception hall of the palace of the military governor. A salute of 45 guns was fired while the document of transfer and President Palma's

*For the history of [illegible] and Cuban wars see 'United States' History,' subdivision, 'The Spanish-American War.'

reply were being read; the troops of the Seventh United States Cavalry, formed in the plaza before the palace, presented arms; the band played the American national air, and the American flag was lowered. Next, the Cuban flag was hoisted and greeted with the national salute of 21 guns by the U. S. S. Brooklyn; the Cuban national air was played; the American troops saluted the Cuban flag, and then immediately embarked. There remained on the island, at Santiago, Cienfuegos, and Havana, small forces of artillery, for the preservation and care of the coast defenses, and to avoid leaving the island entirely defenseless against external attack, pending such arrangements for naval stations as were contemplated. Though the failure to secure tariff concessions from the United States as promptly as was expected increased the difficulty of their financial problems, the people of Cuba have a fair record for the first year of the republic's existence. An intelligent effort was made to keep the most important industries moving along in the usual way, and to preserve order throughout the island — the single conspicuous exception being the strike of tobacco workers, which we have mentioned. From the first the balance in the treasury showed a tendency to increase. The completion of the central railway, connecting Santa Clara with Santiago, and the western with the eastern provinces for the first time by a continuous line of railway transportation, gave a new impetus to industrial development in 1903.

Exports from Cuba to the United States in 1903 (fiscal year) were valued at $62,942,790, or $28,258,106 more than in 1902. On the other hand, exports from the United States to Cuba, which in 1902 were valued at $25,012,109, in 1903 amounted to $20,140,132, a decrease of nearly $5,000,000.

On 2 July, 1903, the coaling-stations and the Isle of Pines treaties were signed at Havana. The former contained the "conditions of the lease of areas of land and water for the establishment of naval or coaling stations in Guantanamo and Bahia Honda," made to the United States in fulfilment of the provisions of article VII of the "Platt Amendment." The treaty relating to the Isle of Pines provided that "The United States of America relinquish in favor of the Republic of Cuba all claim to the title to the island of Pines, . . . in consideration of the concessions of coaling and naval stations which have heretofore been made to the United States of America by the Republic of Cuba."

The famous treaty of commercial reciprocity between Cuba and the United States, designed "to strengthen the bonds of friendship between the two countries, and to facilitate their commercial intercourse by improving the conditions of trade between them," having been approved by the Senate of the United States 17 March 1903, and by the Cuban Senate 28 March 1903, was submitted to the House of Representatives at Washington, convened in extraordinary session 9 Nov. 1903. Consideration of the Cuban reciprocity bill was begun in the House 16 Nov. and was under discussion during the early part of the extra session.

Cuba's population, according to the census taken under the direction of the War Department of the United States, was 1,572,797 on 16 Oct. 1899.

MARRION WILCOX.

Cube, in geometry, a solid contained by six equal square sides. The content of a cube is found by multiplying the superficial area of one of the sides by the height; or, in other words, by multiplying the number that expresses the length of one of the edges by itself, and the product thus found by that number again. Cubes are to one another in the triplicate ratio of their diagonals; and a cube is supposed to be generated by the motion of a square plane along a line equal to one of its sides, and at right angles to it; whence it follows that the planes of all sections parallel to the base are squares equal to the base, and consequently to one another.

Cube, or **Cubic Number**, in arithmetic, the result of taking any number thrice as a factor; thus 64 is a cube number, and arises by multiplying 4 by 4 and the result again by 4.

Cubeb, the unripe fruit of *Piper cubeba*, a climbing perennial with smooth stem and alternate lance-shaped, bright green, shining leaves. It is a native of the West Indies, being extensively cultivated in Java and Sumatra. It was introduced into medicine by the Hindus and Arabians, who employed it widely as a condiment also. Cubebs contain about 14 per cent of volatile oil, a small amount of an indifferent substance termed cubebin, and cubebic acid. It also contains a small amount of resin. A mixture of oils, resins, and acids comprises the oleorosin of cubebs that is used in medicine. It is an active spice somewhat related to pepper, its botanical ally, but the taste is more pleasant and less pungent. It is used as a local stimulant in indigestion and as a flavoring vehicle in mixtures and gargles. It is valuable, particularly in diseases of the mucous membrane, especially of the bronchi, of the bladder and of the urethra. Cubebs are very frequently smoked in cigarettes, in which form they have a pleasant stimulating effect on the mucous membrane of the bronchi and larynx.

Cubic Equations, equations in which the highest exponent of a given quantity in any term is 3. Every such equation of one unknown quantity can be reduced to the form $x^3 + px + q = 0$, where x is the variable and p and q are constants. Every equation of this form has three roots, all of which may be real, or one may be real and two imaginary. An equation containing any number of variables in which the greatest sum of the exponents of the variables in any term is 3 is called a cubic equation. Thus $x^2y + 5y^3 + 6 = 0$ and $xyz + z^3 = 0$ are cubic equations in x, y, and x, y, z, respectively.

Cubitt, SIR **William**, English civil engineer: b. Dilham, Norfolk, 1785; d. 13 Oct. 1861. He was a miller, cabinet-maker, and millwright until 1812, when he became chief engineer in Messrs. Ransome's works at Ipswich. In 1823 he joined the Institution of Civil Engineers, and removing to London, was afterward engaged in most of the public undertakings of his day. The improvement of the Severn and of Boulogne port, the Bute docks at Cardiff, and the water-works for Berlin are among his works. He also invented the treadmill, and constructed the South-eastern Railway; and for his services in connection with the erection of the Great Exhibition buildings he was knighted in 1851.

Cucking-stool, a kind of a chair, used anciently in England and Scotland for the punishment of scolds or refractory women, or for dishonest tradesmen. The culprit was placed in the chair, there to be hooted and pelted at by the mob. It was sometimes used as a ducking-stool (q.v.). It was in common use up to the 17th century. Chambers says that one was used at Kingston-on-the-Thames as late as 1745 A.D., and one at Cambridge till 1780. Townsend states that a woman was punished by means of the cucking-stool at the former place in 1801. Many cucking-stools are still in existence. It was called also goging-stool, trebuchet, castigatory, or tumbrel; and the term cucking-stool, the etymology of which had become unintelligible to the common people before the apparatus itself ceased to be used, was corrupted into ducking-stool.

Cuckoo, formerly spelled cuckow, the English name of a common bird, so called from the note of the male, and now generally applied to all related birds of the family *Cuculidæ* (q.v.). The cuckoo of Europe, the *Cuculus canorus* of ornithologists, perhaps occupies more space in general literature than any other bird, on account of the interest which attaches to its remarkable habit of nest parasitism, and the equally remarkable but unfounded superstitions which have collected about what is to many persons, its mysterious life. It is a common summer bird throughout Europe, retiring in winter to equatorial Africa, its southward migration beginning immediately after the close of the breeding season. During April, May, and June the loud "cuck-oo" of the males is one of the most familiar of country sounds; but it wanes with the breeding season. The eggs are invariably laid in the nests of other birds, the hedge sparrow (*Accentor modularis*) and other similar small species being the victims. The female cuckoo is said to deposit her egg on the ground, from which it is then conveyed in the beak to the nest selected, the rightful contents of which are often cast out. A curious circumstance, the reason for which is not fully understood, is that the cuckoo egg usually hatches before any eggs of its hosts which remain in the nest. The young cuckoo secures the exclusive attention of its foster parents by working itself beneath any eggs or other young birds in the nest, raising them on its back, and tumbling them over the edge of the nest.

The true cuckoos are represented in North America by three or four species of the genus *Coccygus*, of which two, the yellow-billed cuckoo (*C. americanus*) and the black-billed cuckoo (*C. erythrophthalmus*) are the best known and most widely distributed, the former ranging, with its western variety, throughout the United States, the West Indies, and much of the British provinces, the latter being chiefly eastern and migrating in winter far into South America. Both species have the bill strongly curved, stout and somewhat flattened at the base, the feet large, with very short metatarsi, the wings long and the tail long and wedge-shaped. Both are of a plain, uniform, bronzy olive-gray above and white, or nearly so, below. They are readily discriminated by the entirely blue-black bill and the absence of bold markings on the tail feathers of the one species, and the partly yellow bill and broad white margins of the tail of the other. In habits the two species differ but little, and except in the manner of deposition of their eggs, not much from the European cuckoo. Both build nests, which are mere loose platforms of twigs placed in thickets and trees, and lay a considerable but variable number of pale green eggs at long and irregular intervals, with the result that the same nest frequently contains freshly deposited eggs along with young birds. Besides the family taint, which the manner of nesting and oviposition suggest, both species occasionally fall into the parasitic habit and place an egg in another bird's nest; not infrequently the yellow-billed species, which is the chief offender, selects her black-billed relative as the recipient of these parental courtesies. In the northern States the cuckoos are late arrivals from the south, not appearing until the fully leaved trees and bushes afford them the concealment which their retiring tastes demand. Their presence is soon known by the oft-repeated loud cow-cow-cow, etc., the frequent utterance of which, upon the approach of storms, has gained for them the name of rain-crow. As destroyers of hairy caterpillars, which most birds pass untouched, the cuckoos deserve the esteem of horticulturists. Though subsisting largely on caterpillars they also eat other insects and occasionally fruits. The ground cuckoo or chaparral cock (q.v.) and the anis or Savannah blackbird (q.v.) are also American. The number of exotic species of cuckoo is very great, and many of them are interesting and handsome birds which are frequently exhibited in zoological gardens. See CUCULIDÆ.

Cuckoo Bee, a commensal (q.v.) of the *Andrena*, *Halictus*, and other solitary bees, which burrows in the ground. In their slender, smooth, and gaily colored bodies they resemble wasps. The females do not sting severely. Although their eggs are laid in the cells of their hosts, and the larvæ feed upon the pollen stored for the young of their hosts, they are quite different in shape, the head being smaller, and the body more cylindrical. The young as well as the adults of both host and commensal live together harmoniously, the adults of both kinds reaching maturity at the same time. *Nomada imbricata* and *N. pulchella* reside in the nests of *Andrena vicina*, and the former in nests of *Halictus parallelus*. Species of *Stelis* find lodging and board with *Osmia*.

Cuckoo Flies, a species of the hymenopterous family *Chrysididæ*, which, cuckoo-like, live at the expense of various solitary bees and wasps, but, unlike the cuckoo bees (q.v.), actually devour the young of their hosts. They may be seen in hot days briskly flying about and alighting on posts and trees, darting their ovipositor into holes in search of the cells or nests of other *Hymenoptera*, in which to lay their eggs. They feed on the pollen stored up by the host when hatching as maggots. More often they are known to fasten on the back of the larva of their host, suck its blood and thus destroy it; they also appear to destroy the eggs of their host. Although the chrysis lays from 6 to 10 eggs, all but one shrivel up. Chapman has noticed the young larva seize with its mouth-parts a fold of the skin of the helpless larva of the wasp (*Odynerus*) and suck it, without inflicting any visible wound. It spins its cocoon inside that of its host, remaining there until the following spring. The species of

Cleptes is supposed to prey on saw-flies, probably laying their eggs in the cocoons of the latter.

Cuckoo-flower, or **Lady's-smock** (*Cardamine pratensis*), a common and pretty meadow-plant, order *Cruciferæ*, with pale lilac or white flowers. *C. pratensis* is found in swamps and wet meadows from Labrador to northern New Jersey, in Minnesota, and west to the Pacific coast of British America. It is common in England, and throughout northern Europe and Asia. It blossoms in April or May, presenting a very pleasing appearance. It possesses anti-scorbutic properties. The name is also given to the ragged-robin (*Lychnis flos-cuculi*) of the pink family.

Cuckoo-spit, a froth found on plants. It is a secretion of the larvæ of small homopterous insects, of which one of the commonest is the little green *Aphrophora spumaria*, which is very partial to willows. Another closely related green species (*Tettigonia viridis*) is common on meadow plants.

Cucujo, or **Cucuyo,** a luminous beetle of the click-beetle family *Elateridæ*, which, in the West Indies, Mexico, and northern South America, is often used as an ornament in the hair or upon the dress of women. The Indians capture them by waving about in the air a stick to which they have attached a coal, to the light of which the beetles are attracted, when they may be caught in nets. The Indians keep them in cages of wire-netting, feed them each evening upon pieces of crushed sugarcane, and bathe them twice daily in tepid water. In this condition they are offered for sale in large numbers in the shops and street-markets of Vera Cruz and other tropical cities. The principal species (*Pyrophorus noctilucus*) is from one and three quarters to two inches in length, and has no beauty by daylight, being rusty brown or blackish; but when belted and attached to a pin in the hair by a delicate chain it glows at night like an immense gem. See FIREFLY.

Cuculidæ, kū-kū'lĭ-dē, the cuckoo family, the typical one of the order *Coccygomorphæ* (q.v.). The toes are paired, the first and fourth being directed backward, and the second and third forward; the metatarsi are scutellate and the palate is desmognathous; the wings are variable in size and have 10 primary quill feathers; the tail is usually long and wedge-shaped, with 10, or rarely 8, quill feathers. The family is a large one and comprises upward of 40 genera and nearly 200 species, which are especially numerous in Africa and India. Much uncertainty prevails among ornithologists in regard to the number and arrangement of the sub-families. Shelly, in the British Museum Catalogue, recognizes six: *Cuculinæ*, containing the typical tree cuckoos; *Centropodinæ*, semi-terrestrial birds of Africa, India, etc., commonly known as coucals; *Phænicophaïnæ*, also mostly of semi-terrestrial habits and including the curious genus *Coua*, peculiar to Madagascar, some similar genera of the Indian and Indo-Malayan region, and the so-called rain birds (q.v.) of the West Indies; *Neomorphinæ* or *Saurotherinæ*, the true ground cuckoos, comprising the American chaparral cocks (q.v.), and related East Indian forms; *Diplopterinæ* comprising a few little-known birds of South America, and finally the *Crotophaginæ*, a small group of remarkable typical American cuckoos, represented by the Savannah blackbird (q.v.). Sometimes the American tree cuckoos are separated as a distinct sub-family, the *Coccyginæ*. See CUCKOO; COCCYGOMORPHÆ.

Cucumber (*Cucumis sativus*), an annual trailing or climbing vine of the natural order *Cucurbitaceæ*, cultivated for its unripe fruits which are used as a salad and for making pickles. The plant is a native of southern Asia where it has been cultivated since early historic time, as also in Egypt (Num. xi. 5). The vine is more or less prickly, bears three-lobed or angled leaves which closely resemble those of the muskmelon, and generally spiny fruits which may become smooth as they mature. The fruits are solid, and contain numerous boat-shaped flattened seeds imbedded in a somewhat watery pulp, which in the immature fruits is the part esteemed. Small-fruited varieties and little fruits of large varieties are popularly known as gherkins and are generally preferred for pickles. They are covered with strong brine until needed for use, when, after soaking in pure water to remove the salt, they are put in vinegar, which they soon absorb. There is a great range in size of fruits in the various varieties, some being only about two inches long, and others more than 12 inches by three in diameter. Perhaps the most popular group of varieties is the white spine.

Cucumbers thrive best in warm soils well exposed to the sun. They do not produce well upon heavy clays or very light sands. The land must be well drained, in good tilth, and fairly rich. For earliest crop the seeds are often sown in hotbeds on inverted sods, and the plants set in the field as soon as danger of frost has passed, a sowing of seed being made about the same time to serve as a second crop. Usually only two or three plants are allowed to remain in the hills which are made about four by six feet apart. Since the cucumber-beetle is very actively destructive while the plants are small, six or eight plants should be allowed to remain in the hills until the vines are able to resist attack. Cultivation should be very thorough until the plants begin to run, when it should be confined to the space not occupied by vines. Often, in making the hills, a forkful of well-rotted manure is mixed with the soil to give the plants a little start.

Of the numerous diseases that attack the plants the one usually seen earliest in the season is damping-off (*Pythium debaryanum*), which appears while the seedlings are small. Infested plants quickly become yellow, and wilt and die. It may be prevented by early spraying with a standard fungicide (q.v.) which should be applied to the whole hill and to the under sides of the leaves. Wilt disease caused by *Bacillus tracheiphilus*, is an internal trouble that cannot be combated. The bacteria are spread by insects which inoculate healthy vines by biting or puncturing them. The bacteria multiply in the water-vessels of the vines and impede or stop the flow of water, the leaves wilt and finally shrivel, and the plant dies. It is believed that prevention of the attacks of insects by covering the plants with wire netting until they begin to run will postpone the time of the attack of the bacillus, so that a partial crop may be obtained. Usually the vines die just before the crop is ready to gather, the whole field being

attacked. In greenhouses the most common disease is powdery mildew (*Erysiphe cichoracearum*). It appears as white patches on the leaves which become yellow, brown, then die. Often the whole plant is involved. Evaporated (not burned) sulphur and spraying as above will control this pest.

The most important insect enemies of the cucumber are the cucumber-beetles (*Diabrotica*) and the squash-bug (*Anasa tristis*). The beetles are striped or spotted yellow and black, or green and black, are about a third of an inch long, very active in taking flight, and feed mostly upon the under sides of the leaves and the soft stems of seedlings. The larvæ burrow in the roots, and if numerous, they often kill the plants. During the heat of the day the adults generally hide below the surface of the soil. A liberal use of tobacco-dust upon the hills as soon as the plants peep through the soil is the popular remedy. But since remedies are not entirely satisfactory, the plants are frequently covered with netting until they are about to begin running.

The squash-bug is a dull-gray insect about three quarters of an inch long. It sucks the juices of the plants. There is no known satisfactory remedy for it, but the destruction of the vines as soon as they have fruited, or plowing them under, is helpful toward its extermination. Hand-picking is sometimes resorted to, as is also the destruction of the eggs, which are conspicuously laid on the under sides of the leaves. The cucumber is frequently grown in greenhouses, especially in spring after the main winter crops are out. The plants are started in pots, transplanted to the benches when well established, trained on trellises close to the roof, kept at a rather high temperature, and allowed to suffer no check. The white-spine class is most popular for this purpose in America, but the long English forcing varieties are by many considered superior in quality. Consult: Bailey, 'The Forcing-Book' (1897).

Cucumber Beetle. See MELONS.

Cucumber-tree, a popular name for two trees which bear cucumber-like fruits. One of these is *Averrhoa bilimbi*, known also as blimbing and bilimbi, which belongs to the natural order *Geraniaceæ*. It attains a height of 8 to 15 feet, has pinnate leaves, red flowers in long racemes, and green fruits with acid pulp. It is a native of India and China, is sometimes grown under glass for ornament, and is widely cultivated for food in the warm parts of South America. The other tree is *Magnolia acuminata* of the natural order *Magnoliaceæ*. It is found from New York to Illinois and southward to Arkansas and the Gulf States. It often attains a height of 90 feet, bears oval or oblong leaves, greenish-yellow flowers two or three inches long in late spring, and cylindrical pink, bitter fruits three or four inches long. The timber is useful for boat-building. *M. macrophylla* is often called large-leaved cucumber-tree. It is smaller than the preceding, more spreading, has fragrant flowers, and broader and pinker fruits.

Cucurbitaceæ, the gourd or melon family of plants. They are large herbaceous plants, annual or perennial, with alternate leaves palmately veined and scabrous, and unisexual flowers. The corolla is monopetalous, regular, and with five lobes, often planted longitudinally; and the petals, usually either yellow, white, or green, are deeply veined. The fruit is fleshy and more or less succulent. The general habit is climbing or trailing, by means of tendrils. The order contains at least 90 genera and some 600 species, and abounds in useful or remarkable plants, including the melon, cucumber, colocynth, etc. They are natives of both hemispheres, chiefly within the tropics. The annuals, however, easily submit to the summer of colder climates, and hence are common in northern gardens. Eight genera, comprising about 95 species, are found in America. The principal American genera are *Cucurbita micrampelis*, *Cyclanthera*, and *Sicyos*.

Cúcuta, koo'koo tä, or **San José de Cúcuta,** Colombia, a city of the department of Santander, near the Venezuelan frontier. It is a place of recent origin which had begun to grow very rapidly when it was destroyed by an earthquake 18 May 1875. Rebuilt soon afterward, it is to-day the handsomest, and commercially the most active town in the department. A railway connects it with the Zulia River, which is navigable by small steamers. Pop. about 20,000.

Cudbear. See ARCHIL.

Cuddapah, kŭd'da-pä, India, a district and town in the presidency of Madras. The district has an area of 8,722 square miles, and is transversed north to south by the Eastern Ghauts, and watered by the Pennar and its affluents. The heat is intense in April and May. Soda is found in the hills to the southwest, and is used by the natives in place of soap. Salt and saltpetre likewise abound, and are easily procurable. On the plain round Cuddapah hæmatite and fusiform iron ores are found. On the banks of the Pennar, about seven miles northeast of the town of Cuddapah, are diamond mines, which have been worked for several hundred years, and in which gems of considerable value have been found. The mines have not recently proved profitable. Nearly a fifth of the district is under grain cultivation. Cotton is likewise grown. The town lies on a small river of same name, an affluent of the Pennar, 140 miles northwest of Madras. It exports indigo and cotton, and manufactures a kind of coarse cloth. Cuddapah was formerly the capital of an independent state. Pop. 17,200. Pop. of the district 1,354,291.

Cudjo's Cave, an anti-slavery novel by J. T. Trowbridge, published in 1863. The scene of the story is eastern Tennessee, at the outbreak of the Civil War. The State, though seceding, contained many Unionists; and their struggles against the persecution of their Confederate neighbors, slave-holders, and poor whites, form the plot of the book.

Cudlip, Annie Thomas, English novelist: b. Aldborough, Suffolk, 25 Oct. 1838. She is the wife of a clergyman, Rev. Pender Cudlip, and in 1862 began her literary career by publishing 'Sir Victor's Choice.' This was followed by 'Dennis Doune' (1863); 'The Cross of Honor' (1863); and nearly 100 novels. Among the latest of these are 'Comrades True' (1900); 'The Diva' (1901); 'The Cleavers of Cleaver' (1902).

Cudweed, one of the popular names of many small weeds of the genera *Gnaphalium* and *Inaphalis*, of the thistle family. The leaves and stems are covered with a white cottony

down, and the flowers are composed of dry scales, and may be kept for a long time. They are also known as everlasting flowers. The genus *Gnaphalium* has about 120 widely distributed species, and the cudweeds belong properly to this genus alone. *G. polycephalum*, common in old fields and open woods, blossoming in October and November, has some repute in household medicine.

Cudworth, Ralph, English clergyman and philosopher: b. Aller, Somerset, 1617; d. Cambridge 26 June 1688. He was educated at Emmanuel College, Cambridge, and became so eminent as a tutor, that the number of his pupils exceeded all precedent. He was subsequently appointed rector of North Cadbury, Somerset, and in 1642 published a 'Discourse Concerning the True Nature of the Lord's Supper,' and 'The Union of Christ and the Church Shadowed, or in a Shadow.' The first of these productions, which maintained that the Lord's Supper is a feast upon a sacrifice, produced considerable controversy long after the author's death. In 1644 he was chosen master of Clare Hall, and in the following year was made regius professor of Hebrew. In 1654 he was chosen master of Christ's College, Cambridge, where he spent the remainder of his days. In 1678 he published his grand work, entitled 'The True Intellectual System of the Universe, the First Part, Wherein All the Reason and Philosophy of Atheism is Confuted, and Its Impossibility Demonstrated.' It is a work of great power and erudition, although the attachment of the author to the Platonism of the Alexandrian school has led him to advance some opinions which border on incomprehensibility and mysticism.

Cuenca, koo-ĕn'kä, Ecuador, capital of the province of Azuay, and in size the third city of the republic, Quito being first and Guayaquil second. It is situated in the canton of Cuenca, 8,640 feet above the level of the sea; the mean annual temperature is one degree higher than that of the national capital, though it lies 189 miles farther toward the south. As a centre of literary and artistic life, and the birthplace of celebrated authors, it is called "the Athens of Ecuador." Civil, military, and ecclesiastical authorities are: The governor, town council, bishop, commanding-general of the district, superior court of justice, judge of commerce, and chief of police. Principal institutions, etc.: The town hall, cathedral, seven churches, and several convents, orphan asylum, hospital, prison, library, parks, the university (with faculties of law, medicine, philosophy, and science), lyceum for younger scholars, atheneum, and a school of fine arts, giving instruction in drawing, painting, architecture, music, and the history of the arts. The chief industries of the region are: Agriculture, cattle-raising, (gold) mining, embroidering, and lace-making. Peruvian bark is an important product. Pop. 30,000.

Cuenca (anciently Conca), Spain, a city in New Castile, capital of a province of same name, 85 miles east-southeast of Madrid; pop. (1887) 9,747. It is a bishop's see, and contains a fine Gothic cathedral. It was built by the Moors, and stands on a high and craggy hill, about 3,400 feet above sea-level, between the rivers Jucar and Huecar, which makes it naturally strong. Here the painter, Salmeron, and the famous Jesuit, Molina, were born. The north and east part of the province is mountainous, and fit only for sheep pasture; the other parts are fertile, producing corn, hemp, fruit, etc. Pop. about 10,000.

Cuenca, Sierra de, a chain of mountains, a section of the Iberian range, which runs through the Spanish province of the same name.

Cuernavaca, kwär-nä-vä'kä, Mexico, the capital city of the state of Morelos and the chief town of the district of Cuernavaca. It is situated on the river Tepeyte, about 46 miles from the city of Mexico. The Palace of Cortés, where the state legislature meets, is one of its noteworthy buildings; also the meteorological observatory and the public library. Both the city and district have a large trade in the products of the region. Pop. of the city 8,747; of the district 40,014. See Morelos.

Cuervo-Marquez, Luis, loo-ēs kwär'vō mär'kēs, Colombian diplomat and physician: b. Bogota, Colombia, 1864. He was educated in Bogota and Paris, France, graduating from the Escuela de Medicina of Bogota and the Faculté de Médecine of Paris. He has been in the diplomatic service of his country since 1888, serving a part of the time as *charge d'affaires ad interim* in the United States. He has written numerous articles in the literary and professional journals of South America, and published: 'La Fiebre Amarilla' (1891); 'Paludisme' (1893).

Cueva, Juan de la, hoo-än' dā lä kwā'vä, Spanish poet: b. Seville about 1550; d. about 1608. A poet attempting all forms, he excelled most as a dramatist, and is one of the founders of Spanish national drama. In a volume of 'Works' (1582), he published a number of lyric poems, sonnets, songs, and elegies, including the 'Lament of Venus Over Adonis.' His greatest epic is 'The Conquest of Betica' (1603). He wrote four tragedies, one of them on 'The Sack of Rome' by the Constable Bourbon; and 10 comedies, one of the best being 'The Aged Lover.'

Cuffee, Paul, American negro sailor and philanthropist: b. Westport, Mass., 1759; d. 7 Sept. 1818. His father was an African-born Massachusetts slave, who purchased his freedom, bought a farm of 100 acres, and brought up in respectability a family of 10 children; his mother, a Nantucket Indian. At 16 he was a sailor on a whaling vessel, and in 1806 an experienced navigator, owning considerable landed property, houses, stores, a ship, two brigs, and several smaller craft. He built a school-house, hired a teacher, and opened at his own expense the only public school in the neighborhood of his native town. In 1811 he sailed for Sierra Leone in his ship, the Traveler, with a colored crew, won favor there with both whites and blacks, and instituted the Friendly Society of Sierra Leone. In London he was warmly received by Wilberforce and Clarkson, and commissioned by the African Institution to carry goods to Sierra Leone. He died while carrying out his plans for colonizing that country.

Cufic Writing, the written characters of which the Arabians now make use, and with which we meet in printed works, namely, the Neskhi characters, are an invention of the 4th century of the Hegira. Before this time the Cufic characters, so called from the town of Cufa, or Kufa, where they are said to have been in-

varied were in use. These old characters have a close resemblance to the ancient Syriac writing, so strange that it hardly admits of a doubt that the Arabians borrowed them from the inhabitants of Syria. Historical traditions confirm this supposition. The Cufic characters, and perhaps others at an earlier date which certainly resembled them, were probably first introduced among the Arabians a short time before Mohammed. Although we are at present ignorant of the characters which were previously in use among them, and although the imperfect accounts of the Mussulman writers throw very little light upon the subject, yet it is scarcely credible that the Arabians remained destitute of a written character until the 6th century of the Christian era. We find the transition of the Cufic to the Neskhi on the ruins of Chilminar. The influence which the school of Cufa exerted on Islamism caused the use of the character which proceeded from it; and when the others had fallen into oblivion, Cufic writing was the name commonly applied to all kinds of Arabic writing previous to the change made by Ebn Mokla. A knowledge of it is important on account of the many monuments in which it is preserved; especially the coins inscribed with Cufic characters and made in the first centuries of the Hegira.

In connection with these coins are to be considered the small pieces of glass which were introduced, particularly in Sicily, under the dominion of the Mohammedans, instead of money, or perhaps under the sanction of public authority obtained currency as standards of the weight of coins.

Cuir-bouilly, kwēr-boo-lyi, leather softened by boiling, then impressed with ornaments, used for shields, girdles, sword sheaths, coffers, purses, shoes, and many other articles. In the 16th century it was also employed for hangings for rooms gilded and painted, and, when heightened by gold or silver, it was known as cuir doré or cuir argenté.

Cuirass, a breastplate; a covering for the breast; originally, as the name denotes, of leather, also of quilted linen, cloth, etc. The cuirass of plate armor succeeded the hauberk and hacqueton of mail, about the reign of Edward III.; and from that period the surcoat, jupon, etc., which were usually worn over the coat of mail, began to be laid aside. It was again employed by some of Napoleon's regiments, and it is now, in most European services, worn by some regiments of heavy cavalry.

Cuirassier, a cavalryman wearing the cuirass and helmet. The cuirassier represents the horse soldiers of the 16th and 17th centuries, who wore similar armor. The French and German armies have each 12 regiments of cuirassiers, and the Russian army four. Napoleon III.'s bodyguard, called *Les Cent-Gardes*, wore cuirasses of aluminum.

Cuitlalmatzin, or **Citlalmatzin**, Aztec ruler; b. 1470; d. October 1520. He was the younger brother of Montezuma, and after the latter's death, succeeded to the throne, but lived only a few weeks. He was a prisoner in the hands of the Spaniards with his brother, but succeeded in escaping or was released. He organized an active resistance to the invaders and in one of the attacks upon them, Montezuma was killed. The warfare he instituted resulted in the defeat of the Spaniards for the time being, and their retreat to the coast.

Culberson, Charles A., United States senator for Texas; b. Dadeville, Tallapoosa County, Ala., 10 June 1855. In 1850 his parents removed to Texas. Charles A. Culberson was educated at the Virginia Military Institute, Lexington, and graduated in the class of 1874; he prepared for a legal career under his father's tuition, completed his law studies in 1876–7 under Profs. Southall and Minor at the University of Virginia, and was judge of the student law court of the university in 1877; the same year he was the final orator of the Jefferson Literary Society. In 1887 he removed to Dallas, having previously resided at Gilmer and later at Jefferson. In 1890, and again in 1892, he was elected attorney-general of Texas, and in 1894 and in 1896, governor of the State. In 1896 he was appointed chairman of the Texas delegation and delegate at large to the Democratic national convention at Chicago. On 25 Jan. 1899 he succeeded the Hon. Roger Q. Mills as United States senator for Texas.

Culdees, kool'dēz, members of an order of monks or an imitation of such an order, in the British Isles and particularly in Gælic Scotland, of which mention begins to occur in mediæval annals and other writings in the 11th century. The name Culdee, in the Scots Gælic, *Cuilteach*, believed to be equivalent to *gille-Dé* in that dialect and to *ceile-Dé* in the Gælic of Ireland, is by some philologers derived from the Latin *Cultor Dei;* all three words, Scots, Irish, and Latin, meaning servant, or worshipper of God. The Culdees seem to have been immediate successors or continuators of the communities of monks established among the Picts and Scots of North Britain and the Western Isles by Irish missionaries in the 6th century. Like the monks of the Highlands and the Hebrides, the Culdees preserved their clan affiliations and relationships; a community of Culdees — always comprising a few members only — would consist of men all of the same clan and related to each other by kinship. In the course of time the headship or priorate of a community of Culdees, like the headship of a clan, became hereditary, descending from father to son; for these monks, each little priory being autonomous, and not subject to any general superior at Rome or elsewhere, had little respect for their monastic rule or for monastic celibacy; and with the dignity of the prior descended the lordship of the monastic estates. Before they lost entirely the status of a religious order they were in some parts of Scotland recognized as canons regular and as such served cathedral churches. The principal places or convents of the Culdees in their best days were at St. Andrews, Dunkeld, Lochleven, Abernethy, and Brechin.

Culebra (koo-lā'brä) **Island**, subject to the jurisdiction of the government of Porto Rico, and assigned to the department of Humaco, Vieques district. It lies in the passage between Porto Rico and the Virgin group; the name Islas de Pasaje has therefore been given to it and the island of Vieques. Water is supplied by a public cistern. Pop. (1900) 704. See VIRGIN ISLANDS.

Culiacán Rosales, rō-zäl'ēs, Mexico, capital of the state of Sinaloa, and chief town of the district of Culiacán. It is situated about 887 miles from the city of Mexico, and is an important commercial centre, with fine public buildings, including a cathedral, government palace, and mint. A railroad 37 miles long connects it with the seaport town of Altata. It has cotton-mills and other industrial establishments. Pop. 10,487.

Culicidæ, kū-lĭs'ĭ-dē, a sub-family of dipterous insects of the family *Tipulidæ*. The genus *Culex* comprehends the common gnat and the mosquito (q.v.).

Culil'awan Bark, the aromatic pungent bark of the *Cinnamomum culilawan*, a tree of the Moluccas; useful in indigestion, diarrhœa, etc. Called also clove-bark.

Culin, Stewart, American anthropologist: b. Philadelphia, Pa., 13 July 1858. He is curator of the Museum of Science and Art of the University of Pennsylvania, and one of the foremost anthropologists of America. Besides many minor papers, he has written two very able monographs, 'Korean Games' (1896); and 'Chess and Playing Cards' (in Report of the United States National Museum 1896); also an essay on 'Mancala, the National Game of Africa' (in Report of the United States National Museum 1894).

Culinary. See COOKERY.

Cullen, Paul, Irish Roman Catholic prelate: b. near Ballytore, County Kildare, 27 April 1803; d. Dublin 24 Oct. 1878. He was ordained priest in 1829, and filled in succession the offices of vice-rector and rector of the Irish College in Rome, and rector of the Propaganda College. During the period of Mazzini's power in Rome in 1848, Cullen saved the property of his college by placing it under American protection. At the close of 1849 he unexpectedly found himself nominated to the archbishopric of Armagh and primacy of Ireland. His vigorous denunciations of Fenianism made him many enemies. At the Synod of Thurles in 1851, principally by Cullen's persuasion, the establishment of a Roman Catholic university in Ireland was recommended. Translated to Dublin in 1852, he was created a cardinal priest in 1866, the first Irishman who had reached that rank. One of the majority at the Vatican council, he long enjoyed the familiar friendship of Pope Pius IX.

Cullera, kōl-yā'rä, Spain, a fortified town in the province of Valencia, and 25 miles south by east of Valencia, on the Jucar River. Its natural position makes it a place of military importance, and though its fortifications have been repeatedly dismantled, they are now in an efficient state. Pop. 12,000.

Cullo'den Moor, a heath in Scotland, four miles east of Inverness. It is celebrated for a victory obtained 27 April 1746, by the Duke of Cumberland over Prince Charles Edward Stuart (the Pretender) and his adherents. The battle of Culloden was the last battle fought on British soil, and the termination of the attempts of the Stuart family to recover the throne of England. A monumental cairn and green mounds have been raised where the fiercest of the fight raged, and where many of the slain are buried.

Cullom, Shelby Moore, American senator: b. Wayne County, Ky., 22 Nov. 1829. In 1853 he went to Springfield, Ill., to study law, was admitted to the bar, and settled in practice there. He was in the Illinois House of Representatives 1856, 1860, 1872, 1874, and its speaker in 1861 and 1873. He was elected to Congress 1865–71. At the Republican national convention, 1872, he nominated Gen. U. S. Grant. He was governor of Illinois 1877–83, when he succeeded David Davis in the United States Senate, and has been thrice re-elected. He was chairman of the senate committee which reported the Interstate Commerce Bill, and a member of the commission appointed to prepare a system of laws for the Hawaiian Islands. His report on the regulation of railroad corporations by national legislation, presented to the Senate, 18 Jan. 1886, has taken its place as a permanent contribution to economic literature.

Cullum, George Washington, American military officer: b. New York 25 Feb. 1809; d. there 28 Feb. 1892. He was graduated from West Point in 1833; and was engaged for the next 28 years in engineering labors and in instructing at West Point in practical military engineering. During the Civil War he was chief of staff to the general-in-chief 1861–4, and superintendent of the military academy 1864–6. From that time he was a member of the board of engineers for fortifications, until he was placed on the retired list in 1874. At the time of his retirement he was colonel and brevet major-general in the regular army. Besides numerous military memoirs and reports, he published: 'Military Bridges with India-rubber Pontoons' (1849); 'Register of Officers of the U. S. Military Academy from 1802 to 1850' (1850); a translation of Duparc's 'Elements of Military Art and History,' with notes, etc. (1863); a 'Biographical Register of the Officers and Graduates of the U. S. Military Academy' (1868) (revised edition 1879); 'Campaigns of the War of 1812 Criticised' (1880). He bequeathed $250,000 for the erection of a memorial hall on the grounds of the military academy, and $40,000 for furnishing it with military busts, paintings, and other appropriate objects.

Culm, a term used in the United States to designate waste anthracite coal. At one time disposal of the culm heaps surrounding the shafts of the mines in Pennsylvania, became a serious problem, until its use as fuel was made possible, either by burning it in special grates, or by pressing it into briquettes (q.v.). In England the culm is sometimes made up into balls, with one third of its bulk of wet clay. This mixture burns without flame, and gives a steady heat suitable for cooking. In botany culm is the straw or hollow stem of the grasses.

Culmina'tion, an astronomical term, signifying the passage of a star across the meridian. The star is then at the highest point (*culmen*) of its course; hence the name. The sun culminates at mid-day, or 12 o'clock, apparent solar time — which seldom agrees exactly with mean time, as shown by a watch or clock. The full moon culminates at midnight. The term is interchangeable with transit.

Culpepper, John, English colonial leader in the provinces of North and South Carolina. He was a refugee from the southern or Clarendon colony, and in 1678 was the head of an

insurrection in the northern or Albemarle colony in favor of popular liberty. The insurgents later sent Culpepper to England to negotiate a compromise. He was indicted for high treason, but through the influence of Shaftesbury was acquitted on the ground that no regular government had existed in Albemarle. He returned to Carolina, and in 1680 laid out the city of Charleston, reducing the paths, streets, and squares to comparative regularity, and enclosing the town site with a line of fortifications.

Culpepper, or Colepeper, Thomas, American royal governor, b England; d. there 1719. He was one of King Charles II's favorites, who received from that monarch a grant of the entire territory of Virginia for a period of 31 years from 1673, a grant so astounding in character that, in the opinion of at least one historian, nothing but the very deed itself, still extant, could be accepted as evidence of the fact. He was governor of Virginia 1682–3, and two years later relinquished most of his Virginia grant, retaining only a portion called Northern Neck, and securing, instead of the remainder, an annual pension of £600 for 20 years. His whole career was actuated by the meanest rapacity, an example of which may be seen in his trying to swindle the colonists by paying the public wages in light coin, on which he had himself put an arbitrary value. Consult Doyle, 'English Colonies in America,' Vol. I. (1882).

Culprit Fay, The, a poem by Joseph Rodman Drake (q.v.). It relates the love of a fairy for a mortal, and the punishment of the offense.

Cumæ, kū'mē, a very ancient city in Campania, and the oldest colony of the Greeks in Italy, was founded about 1030 B.C. by colonists from Chalcis in Eubœa, and from Cyme (Greek Kumē) in Asia Minor. The common belief of the inhabitants made it the residence of the Cumæn sibyl, though her home was really in Asia, and was no doubt transferred to Italy by the Asiatic colonists. She founded Naples (Neapolis), and in Sicily Zancle or Messina. In 420 B.C. Cumæ was taken by the Campanians, and came with them under the power of Rome (345 B.C.). It was destroyed 1207 A.D.; and all that remains of the city are some ruins of an amphitheatre, of a small temple, and masses of masonry, evidently of Roman construction.

Cumana, koo-mä-nä', Venezuela, capital of the new state of Sucre, which formerly constituted a section of the state of Bermúdez. It was founded by Gonzáles Ocampo in 1520, and is situated on the banks of the Manzanares River, one mile from the southern coast of the Gulf of Cariaco. The city is celebrated as being the first permanent settlement of Europeans on that coast. Being situated on ground of volcanic formation, the city is subject to frequent earthquakes. The surrounding country is fertile, producing especially fine grapes, pineapples, and other fruits, and such tropical plants as coffee and cacao. A railroad connects the city with the gulf; the port has a flourishing foreign commerce. Pop. about 10,000.

Cumarin. See COUMARIN.

Cumberland, Richard, English dramatist and essayist, b Cambridge 19 Feb. 1732; d. Tunbridge Wells 7 May 1811. His comedies, 'The West Indian', 'The Wheel of Fortune'; 'The Jew'; and 'The Fashionable Lover,' are an epitome of the culture of the time; as are his essays, collected under the title of 'The Observer.' He wrote novels, tracts, religious, and didactic poems, not now important; 'Anecdotes of Eminent Painters in Spain', 'Memoirs' (1806).

Cumberland, Md., a city and the county-seat of Allegany County; 150 miles southeast of Pittsburg, Pa., 178 miles northwest of Baltimore, and 152 miles northwest of Washington, D. C. It is picturesquely located on the Potomac River, about 700 feet above tide water. It is also on the Baltimore & Ohio, the Pennsylvania, and other railways; and on the Chesapeake & Ohio Canal, which extends thence to Georgetown, D. C.

Industries, etc.— Cumberland is situated at the edge of the Chesapeake & Ohio Canal coal region, the carrying of coal being the principal business of that waterway. It is the shipping-point for the large quantities of the semi-bituminous variety mined in that section. Its manufactures also are considerable. They include cement-works, glass-works, brick-works, flour-mills, tanneries, steel-works, iron-foundries, and numerous other enterprises. Here are located further large rolling-mills for the manufacture of rails, bars, and other materials of railway supply, as well as railway car and repair shops. A large capital is invested in the mercantile interests.

History, Government, etc.— Fort Cumberland was built in the winter of the years 1754–5, at the beginning of the French and Indian war. On the site of the fort, Cumberland was laid out in 1785. It was incorporated in 1815, and became a city in 1850. The government of Cumberland is directed by a mayor, who is biennially elected, and a city council, the members of which are chosen in part by wards and to some extent at large. The admirable system of water-works, which is operated on the Holly plan, is owned and managed by the municipality, as is also the electric-light works. The mayor nominates to the various boards of administration, his nominations being subject to the approval of the council. Pop. (1800) 12,729; (1900) 17,128.

Cumberland, R. I., a town in Providence County, a few miles north of the city of Providence, on the New York, New Haven & Hartford Railroad. It has extensive manufactures of cotton goods, and iron wares. Pop. (1900) 8,925.

Cumberland, Army of the, in the American Civil War; a name applied to one of the principal Federal armies, which prior to 30 Oct. 1862, had been known as the Army of the Ohio. On this date Gen. W. S. Rosecrans assumed command and a new army of the Ohio was formed. The Army of the Cumberland continued under the command of Gen. Rosecrans until October 1863, when Gen. George H. Thomas became commander.

Cumberland, Fort, built 1754–5 by Braddock (q.v.) as a basis for his expedition against Fort Duquesne. Cumberland, Md., occupies the site of what was once Fort Cumberland. It was left in command of Col. James Innes, and the remnant of the expedition returned to it. Washington afterward commanded it. The

name was also given by the English in 1755 to Fort Beausćjour in Maine, captured from the French who had built it the year before.

Cumberland, a river which rises in the Cumberland Mountains, Virginia, and runs through Kentucky and Tennessee into the Ohio, 60 miles from the Mississippi, having a course of about 600 miles. It is navigable for steamboats to Nashville, nearly 200 miles, and for boats of 15 tons 300 miles farther. At certain seasons vessels of 400 tons may descend 400 miles to the Ohio.

Cumberland Gap, a passage through the Cumberland Mountains, on the line between Kentucky and Tennessee and at the western extremity of Virginia. It is noted for many incidents connected with the Civil War.

Cumberland Gap, on the dividing line of Virginia and Kentucky on the north, and Tennessee on the south, is the main gateway of the Cumberland Mountains, between eastern Kentucky and East Tennessee. Early in the Civil War it was occupied by the Confederates and remained in their possession until 18 June 1862, when, in view of a concentration of the Confederates at Chattanooga, which was threatened by the advance of Gen. O. M. Mitchell from Huntsville and Bridgeport, Ala., it was evacuated, and was occupied by Gen. Geo. W. Morgan, who, with a division of 8,000 men, had been operating against it for nearly two months. Morgan fortified it, established magazines and an arsenal, from which thousands of arms, with ammunition, were distributed to the Union men of East Tennessee, and remained in possession until 17 Sept. 1862. Then Gen. E. Kirby Smith, having crossed the mountains south and defeated Gen. Nelson at Richmond, Ky. (29 and 30 August), thus cutting off communication from the north, while Gen. C. L. Stevenson with a division of 9,000 men was pressing him in front, Morgan, short of provisions and forage, and not prepared for a siege, blew up his arsenal and magazines, set fire to his storehouses, and at night, 17 September, started on a march of 200 miles through an almost unbroken wilderness to Greenup, on the Ohio river. He reached there 3 October without the loss of a gun or a wagon, and with the loss of only 80 men, although pursued some distance by Stevenson, and harassed much of the way by Morgan's cavalry. Bragg retreated through the Gap, after the failure of his Kentucky campaign, and it remained in Confederate possession a year. Gen. Burnside entered Knoxville 3 Sept. 1863, and finding the Gap occupied by Gen. John W. Frazer, with a brigade of 2,300 men, ordered Gen. Shackleford with a cavalry brigade to approach it from the south and co-operate with Col. De Courcy, who, with a division of new troops, had been ordered to march on it from the north. Shackleford reached the south end of the Gap on the 7th and communicated with De Courcy, who had arrived on the north side, and both summoned Frazer to surrender, who refused. Burnside led an infantry brigade from Knoxville, joined Shackleford on the morning of the 9th and at his demand Frazer surrendered his force of over 2,000 men, with 12 guns and a large supply of ammunition. The Gap remained in Union possession to the close of the War. Consult: 'Official Records,' Vol. XXX.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III. E. A. CARMAN.

Cumberland Island, now thought to be a peninsula of Baffin Land, extending into Davis Strait.

Cumberland Mountains, that portion of the Appalachian group which ranges along the southwest border of Virginia and the southeast of Kentucky, and passes across the State of Tennessee into the northeastern part of Alabama. It spreads over a width of about 50 miles, parallel ridges alternating with longitudinal valleys. The ridges rarely exceed 2,000 feet high. They are rocky and little cultivated, but the valleys are fertile. These mountains lie west of the range of the granite and metamorphic rocks, which compose the mountains on the western borders of North Carolina and the northern part of Georgia. They are upon the range of the great coal formation of the Middle States, and essentially composed of the same groups of stratified rocks as those of the Alleghany Mountains, Chestnut Ridge, and Laurel Hill in Pennsylvania. The Tennessee River and its branches drain a portion of the eastern slope.

Cumberland Presbyterians. See PRESBYTERIANISM.

Cumberland Road, The, or Great National Pike, originally, a road planned from the Maryland frontier at Cumberland, Md., to connect with the State roads and run to St. Louis (then just fallen into United States hands by the Louisiana Purchase); to open up the West to immigrants, and provide for military and postal transportation. It was to be built at national expense from the sales of public lands, as a fair counterpoise to the seaboard States' ability to pay their expenses by levying customs duties; and pushed forward by sections as settlement advanced. Henry Clay was its most conspicuous projector and advocate, and a monument to commemorate his services to it has been erected on its course near Wheeling, W. Va. The bill for the first section passed Congress 29 March 1806; it authorized the President (Jefferson) to appoint three commissioners to lay out the road from Cumberland to the Ohio River (Wheeling), and appropriated $30,000 for expenses. At the same time another was passed to lay out one through Georgia, on the New Orleans route; and others followed in swift succession for two decades. This policy of roads, soon supplemented by canals, became the great battle-ground for the strict-construction party, who fought the whole policy of internal improvements as unconstitutional; and the Cumberland Road with its constant call for improvements and repairs aroused ever fresh resistance. Finally in 1822, Monroe, although he had signed two annual bills of the kind, vetoed a third; and for the time the improvements and new roads came to a standstill. With John Quincy Adams, who was in thorough sympathy with Clay's policy, as with every other to increase the national wealth and power, the system started up afresh; and the Cumberland Road was pushed forward through Ohio and Indiana. On the accession of Jackson, a strict-constructionist, the vetoes began and the roads stopped; with Van Buren the latter commenced again, and by 1840 the road had advanced to Vandalia, Ill. By this time the railroads had become so decisively the coming transportation system that no more was built; the last act in its favor was passed 25

May 848. It was admirably constructed, macadamized, with stone bridges, and iron mile posts and toll gates, and the total amount expended on it by the United States was $6,821,240. The name 'Cumberland Road' in current use was extended to take in the section from Cumberland through Frederick to Baltimore, built largely by Maryland banks, which were rechartered in 1816 on condition of completing it. It was a most profitable speculation, the tolls yielding them sometimes as high as 20 per cent, though finally sinking to 2 or 3 per cent. The portion built by the national government was acquired in 1878 by the counties of Alleghany and Garrett, which made it a free road. The whole road from Baltimore to Vandalia is about 800 miles long. Consult: Hulbert, 'The Cumberland Road' (1903); Riding, 'The Old National Pike' ('Harper's Magazine,' Vol. LIX., 1879).

Cumberland University, located at Lebanon, Tenn. The history of higher education in the Cumberland Presbyterian Church begins with the year 1826, when Cumberland College was established at Princeton, Ky. From the beginning the college was seriously embarrassed by a small debt and a too meager income; and so year by year the situation grew worse, as the burden resting on the General Assembly grew heavier. Finally, in 1842, after fruitless efforts to lift the debt and endow the college, the General Assembly "appointed a committee to select a suitable location for the establishment of a new institution." After investigation the committee decided on Lebanon, Tenn. For a few years it was called Cumberland College, but in 1844 the name was changed to Cumberland University. The University was first chartered 30 Dec. 1843, which charter has been several times amended. The board of trustees is local and self-perpetuating. The election of new members, however, must be confirmed by the General Assembly of the Cumberland Presbyterian Church. The Law School was opened in 1847. Its growth from the beginning was remarkable, and in 1856 it was considered the second in size among the law schools in the country. By the concurrent action of the General Assembly and the board of trustees the Theological School was established in 1852. The School of Engineering was also established in 1852. When the Civil War began, the value of buildings and apparatus belonging to the University was very creditable. Moreover the University was in a very prosperous condition, the number of students in 1858 — the most successful year before the war — being 481. During the war the University suffered a fate like that of many other Southern schools. The buildings were burned, apparatus and library destroyed, the endowment was rendered worthless, and many of the trustees and friends lost all hope of reorganization. Notwithstanding all this, a few faithful ones determined to attempt the seemingly impossible and in January, 1867, the University was reopened without buildings, endowment or apparatus. Since the "resurgence from ashes" the University has had a steady growth. Its buildings are new, large and commodious, its libraries, general and departmental, number more than 20,000 volumes; its apparatus is valued at many thousand dollars, and its influence reaches far and wide through the Union.

The University has had five presidents all of whom have done noble work. In 1902 David E. Mitchell was elected to the presidency of the institution. He is the youngest college president in the United States. His administration has revolutionized the University. Two new departments have been added: The School of Oratory and the Conservatory of Music. A magnificent new dormitory has been erected on the campus. The equipment has been very much improved; the student body greatly increased. Total enrollment, 1903–4, 648. The University has two splendid training schools, one for boys, the other for girls, in Lebanon. The institution is coeducational.

P. MARION SIMMS,
Registrar of Cumberland University.

Cumbrian Mountains, a range of hills, England, occupying part of the counties of Cumberland, Westmoreland, and North Lancashire. The mountains rise with steep acclivities, enclosing in some parts narrow but well-cultivated valleys, with numerous picturesque lakes, this being the English "Lake Country," so much frequented by tourists.

Cumin, kŭm'ĭn, **Oil of,** the expressed product of a long-known umbelliferous plant, grown in Egypt and Ethiopia, and largely cultivated in Sicily and Malta, whence it is brought to this country. Cumin seeds, when distilled with water, yield a pale-yellow limpid oil of disagreeable odor and harsh taste, consisting of an oil called cuminol, hydride of cumyl, or cuminic aldehyde ($C_{10}H_{12}O$), and cymene or cymol ($C_{10}H_{14}$). Cuminol and cymol can only be partially separated by distillation, cymol being the more volatile, but cuminol is better removed by causing it to combine with hydropotassic sulphite. When pure, cuminol is a colorless liquid, lighter than water, boiling about 430° F. The other constituent, cymol ($C_{10}H_{14}$), is a colorless, strongly refracting, lemon-smelling fluid, which has a specific gravity of 0.85, and boils about 350° F. It is insoluble in water, but dissolves in alcohol, ether, and oils.

Cuminum, the fruit of *Cuminum cyminum*, a close relative of caraway, with which it is allied in properties and uses. See CUMIN, OIL OF.

Cumming, Alfred, American territorial governor: b. 1802; d. 1873. When the Mormons under Brigham Young disputed the authority of the Federal government, President Buchanan, in 1857, sent Cumming to Utah as governor, with a force of 2,500 men. He at once declared the territory to be in a state of revolt, to which Young replied by a proclamation forbidding the army to enter the territory. It was not until 1858 that Cumming regularly assumed office, in which he was supported by the troops for nearly two years. Cumming held the position until 1861. See UTAH.

Cummings, Amos Jay, American journalist: b. Conkling, N. Y., 15 May 1841; d. Baltimore, Md., 2 May 1902. At the age of 12 he entered a printing office as an apprentice, and was accustomed to say that he had set type in nearly every State in the Union. He was with Walker in the last invasion of Nicaragua; was a sergeant-major in the 26th New Jersey Infantry during the Civil War; and received

the congressional medal of honor for gallantry on the battlefield. In 1863 he entered the service of the New York *Tribune* under Greeley, and later was on the staff of the New York *Express* and the *Sun* successively. From 1887 until his death he was a Democratic representative in Congress from New York city districts.

Cummings, Charles Amos, American architect: b. Boston, 26 June 1833. He was educated in the Boston schools and at the Rensselaer Polytechnic Institute, Troy, N. Y., and till his retirement, some years since, practised his profession in his native city. He published a valuable 'History of Architecture in Italy from the Time of Constantine to the Dawn of the Renaissance' (1901), and collaborated with W. P. P. Longfellow (q.v.) in 'A Cyclopædia of Works of Architecture in Greece, Italy, and the Levant' (1897).

Cummings, Edward, American Unitarian clergyman: b. Colebrook, N. H., 20 April 1861. He was graduated at Harvard 1883, and from its Divinity School 1885, and was the first incumbent of the Robert Treat Paine fellowship in Social Science 1888–91; studying in England, France, Italy, and Germany. He was instructor in sociology at Harvard 1891–3, and associate professor 1893–1900, when he became associate pastor of the South Congregational Church, Boston, Mass.

Cummings, Joseph, American educator: b. Falmouth, Me., 3 March 1817; d. Evanston, Ill., 7 May 1890. He graduated at Wesleyan University, Middletown, Conn., 1840; entered the Methodist ministry 1846, and held pastorates at Malden, Chelsea, and Boston, Mass., 1846–53. He was president of Genesee College, Lima, N. Y., 1854–7; president of Wesleyan University, 1857–75; professor of mental philosophy and political economy there 1877–9; and president of Northwestern University from 1881 until his death.

Cummings, Thomas Seir, American artist: b. England 1804; d. Hackensack, N. J., 24 Sept. 1894. He studied chiefly under Henry Inman, and worked mostly at miniature painting. He was a founder of the National Academy of the Arts of Design 16 Jan. 1826, an organization of 15 members who each chose another.

Cummins, Albert Baird, American lawyer and governor: b. Carmichaels, Pa., 15 Feb. 1850. He received an academic education at Waynesburg, Pa., was admitted to the bar, and settled in practice at Des Moines, Ia. From 1896 to 1900 he was a member of the Republican National Committee, in 1901 was elected governor of Iowa, and in 1903 was nominated for the term of 1904–6.

Cummins, George David, American clergyman: b. Kent County, Del., 11 Dec. 1822; d. Lutherville, Md., 26 June 1876. He was graduated at Dickinson College, Pa., 1841; ordained to the Episcopal ministry 6 July 1847, and was successively rector at Norfolk, Va., Richmond, Va., Washington, D. C., Baltimore, Md., and Chicago, Ill., until consecrated assistant bishop of Kentucky 15 Nov. 1866. In November 1873 he resigned his office and withdrew from the Church, preliminary to taking steps to form a new sect, "The Reformed Episcopal Church," of which he was made the presiding bishop December 1873. (See Reformed Episcopal Church.) He was formally deposed from the Protestant Episcopal ministry 24 June 1874.

Cummins, Maria Susanna, American novelist: b. Salem, Mass., 9 April 1827; d. Dorchester, Mass., 1 Oct. 1866. Her novel, 'The Lamplighter' (1853) had enormous success and was translated into foreign languages; it is still remembered for the idyllic charm and tenderness of its first few chapters, but the rest is commonplace. Her other books are: 'Mabel Vaughn' (1857); 'El Fureidis' (1860); 'Haunted Hearts' (1863).

Cumnor Hall, a ruined manor house near Oxford, England, the "Cumnor Place" of Scott's 'Kenilworth.' Meikle's musical ballad of 'Cumnor Hall,' a lament for Amy Robsart, furnished Scott, as is supposed, with the motive of 'Kenilworth.'

Cumulative Voting, the system by which every voter is entitled to as many votes as there are persons to be elected, and may give them all to one candidate, or may distribute them among the candidates, as he thinks fit. The practice was first introduced into Great Britain in 1870, and used in the election of school boards, and later in parliamentary elections. Although the general adoption of the system has been urged as a desirable reform it has not had much success. The States of Illinois and Michigan have used the method in some elections, and its legality was questioned. The supreme court of the latter State declared it constitutional.

Cumyn, Comyn, or Cumming, a family whose name appears frequently in the early history of England and Scotland. It had its possessions near the town of Comines, and from one of the branches sprang the historian Philip de Comines (q.v.). The English Comyns came over with the Conqueror, and in the middle of the 13th century the family counted among its members 4 Scottish earls, 1 lord, and 32 belted knights. In the beginning of the 14th century it was almost annihilated by its rival competitor for the Scottish crown, Robert Bruce. Such of the Cumyns as contrived to escape made their way to the English court, and by their talents secured considerable influence in the sister kingdom.

Cunard', Sir Samuel, English ship-owner: b. Halifax, Nova Scotia, 21 Nov. 1787; d. London 28 April 1865. Becoming early a successful merchant and ship-owner, he went to England in 1838, and joined with George Burns and David M'Iver in founding (1839) the British and North American Royal Mail Steam Packet Company. The first passage was that of the Britannia in 1840. From its small but successful beginning, Cunard's undertaking soon developed into one of the most influential private commercial enterprises. He was knighted in 1859.

Cunaxa, kū-năks'a, Mesopotamia, east of the Euphrates, about 60 miles north of the site of the ancient city of Babylon. Famous in history for the defeat of the younger Cyrus, 401 B.C. See Xenophon.

Cundall, Frank, English librarian: b. 1858. He has been librarian of the Institute of Jamaica at Kingstown from 1891, and is the author of 'Reminiscences of the Colonial and Indian Exhibition'; 'The Landscape and Pastoral Painters of Holland'; 'Story of the Life of Columbus and the Discovery of Jamaica'; 'Bibliotheca

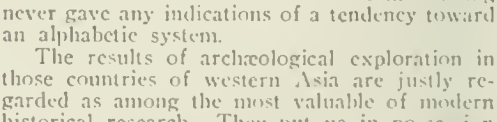
Jamaica is' 'Studies in Jamaica History'; 'Jamaica' in 'British Empire Series'; 'Hans Hallam.'

Cundinamarca, kŏn-dē-na-mär'ka, Colombia, a department bounded on the north by Venezuela and the departments of Boyacá and Santander, on the east by Venezuela, on the south by the department of Cauca, and on the west by the departments of Antioquia and Tolima. Area 79,810 square miles. Its capital, Bogotá, is also the capital of the republic. (See BOGOTÁ and COLOMBIA.) The eastern Cordillera of the Andes traverses the department from south to north, separating into various branches. On the west lies the valley of the Magdalena River, above which rise the highest mountains, the Nevado of Sumapaz, Cruz-Verde, the "páramos" of Chamizal, Pasquilla, El Hato, and Choachi. On the east is a great plain, fertile and abounding in cattle. There innumerable streams form the Meta and Guayabero rivers, which belong to the Orinoco system; the more important of these tributaries being the Cabuyaro, the Guatiquia, Rio Negro, the Guayuriba, the Chichimene, the Gunal, and the Pajure. Rivers of the western region, belonging to the Magdalena system, are the Fusagasugá, the Seco, the Bogotá (which in its upper reaches, above the splendid falls of Taquendama, is called the "Funza"), etc. In the centre of the department are the elevated plains of Bogotá, Ubaté, and Simijaca. Pop. 500,000.

Cundurango, kŭn-dŭ-răn'gō, the bark and wood of a vine growing in Ecuador, South America, supposed at one time to be a specific for cancer.

Cuneiform Writing is so called because its characters consist of strokes of the shape of a wedge (Latin, *cuneus*); and for a like reason it is also known as arrow-headed: it is a mode of writing widely used in early times, and till the downfall of the Babylonian and Assyrian empires, in the region of the Euphrates and Tigris and in contiguous countries lying northward and eastward of those empires, as Armenia, Persia, Media, Susiana. This manner of writing was an outgrowth of a primitive hieroglyphy most probably originating among the peoples of that part of western Asia and not derived from Egypt. For an account of the archæological researches in Babylonia and Assyria see the article BABYLONIA, where the invention of cuneiform writing is credited to the Accadian population of Chaldæa, from whom it passed to a Semitic people, their conquerors, later known as Babylonians and Assyrians. Before the conquest the cuneiform writing of the Accadians had been adapted by them not only to ideographic representation — representation of objects or notions, as the sign $ denotes dollar or as in astronomy the trident ♆ stands for the planet Neptune — but also to representation of sounds. This was a step in the direction of alphabetic writing, but the cuneiform system never reached that ulterior development, and its highest achievement was the production of a syllabary — a catalogue of the syllables of the language. The transition from the ideographic to the phonetic use was a long step toward perfection as it immensely simplified the problem of writing by reducing to a comparatively small number of different characters the infinity of emblems required for ideographic representation. It was as though a sign, as , originally, let us suppose, the ideograph for tree, were made to stand for the syllable ta, to, etc.: in that case all words beginning with the syllable ta or to would be represented by a form of expression having that sign for its first element, and not by an independent arbitrary form.

The cuneiform writings found among the ruins of the Assyrian, Babylonian and other ancient cities of Western Asia were either impressed with a stylus on tablets of moist clay which was then kiln-baked or they were incised with a chisel on monuments of stone. The wedge either stands upright, or inclined at an angle, or lies horizontal, or two wedges form an angle coming together at their points, or at their bases. A few examples will give an idea of the manner of combining them for the expression of ideas:



In its stage of highest development the cuneiform writing was exceedingly complex and clumsy, and the fact that it was made to serve so well as it did the needs of the Babylonians and Assyrians as a means of literary expression, as the vehicle of laws and as a means of historical record, gives striking demonstration of man's invincible effort to develop his intellectual and moral powers. It was a very simple thing to make the ideograph speak to the ear as well as to the eye — to represent, for example, the sun (utu) by an ideograph and then to make that symbol stand for the syllable ut in all situations; but it was a beginning, and out of it was constructed as efficient a mechanism as was allowed by the refractoriness of the material of construction. But the cuneiform writing never gave any indications of a tendency toward an alphabetic system.

The results of archæological exploration in those countries of western Asia are justly regarded as among the most valuable of modern historical research. They put us in possession of much of the literature and much of the early history of peoples whose record seemed already lost past recovery as far back as the time of Herodotus (5th century B.C.) or at least of Berosus (3d century B.C.) of whose writings only some fragments have come down to us: our knowledge of the history of those great empires, beyond a few incidental notices in the Bible, was drawn mainly or wholly from those two historians; but now, thanks to the researches of our contemporaries, we have with regard to many points of Assyrian and Babylonian history fuller and more authentic information than we possess regarding the history of ancient Greece and Rome.

No one document of the thousands that have been unearthed in the course of those explorations surpasses or even equals in interest the code of King Khammurabi (the Amraphel of Genesis xiv. 9, "King of Shinar" or Elam, called also in the Scripture Shushan, and by the Greeks and Latins Susiana, from the name of the capital city Susa). This code, discovered at

the site of ancient Susa in 1901, afterward translated by the Dominican friar Schiel, who was the Assyriologist of Monsieur de Morgan's exploring expedition, and published in 1903 by order of the French minister of public instruction, is inscribed on a great monolith of granite; it dates from 2200 B.C. It consisted originally of about 3,000 lines of writing in 49 columns, five of which are effaced; but the rest of the inscription, being of a very beautiful type, is still plainly legible. The code begins with a law relating to witchcraft or sorcery, and touches all grades of social and domestic life, even determining the wages of workmen and laborers from the lowest to the highest. Very curious is the law regarding enchantments or sorcery. The person on whom the spell of enchantment has been laid must plunge into the Euphrates: if he sinks and drowns, his house goes to the sorcerer; but if he floats the sorcerer forfeits his life and his house. Proof of the general use of writing in Khammurabi's dominions is seen in the requirement of written testimony in lawsuits and in business transactions. The code commands that land be kept in cultivation; uncultivated and unimproved land is taxed at the same rate as neighboring cultivated land. The farmer whose crop is seriously damaged by storm is excused from paying interest on money loaned him. He through whose neglect the irrigation canals and ditches cause damage must make good the loss. The wine-shop keeper — usually, it would appear, a woman — is required to "seize and drive to the palace" riotous persons who resort to her place: failing to do this she incurs the penalty of death. The defamer of an honest woman, be she wife or "votary," is to be branded on the forehead. A man was permitted to divorce his childless wife. If a man divorces his wife without cause he must allow her alimony and custody of her children, also a share in his estate equal to a son's portion. Here are some points at which Khammurabi's code touches matters which were afterward made the subject of Hebrew legislation. Says the Elamite king: "If a man strike another in a quarrel and cause him a wound and he shall swear 'I did not strike him knowingly' he shall answer for the doctor." The Hebrew law (Deut. xxi. 19) prescribes as penalty for one who smites another with stone or fist so that the injured man keepeth his bed, that the smiter shall "pay for the loss of his time and shall cause him to be thoroughly healed." The Hebrew law punished with death "him that smiteth his father or his mother"; the punishment decreed by Khammurabi for the same offense was loss of the hands.

JOSEPH FITZGERALD,
Author of 'Word and Phrase.'

Cunene, koo-nā'nĕ, a river of South Africa, rising in about lat. 13° S. and entering the Atlantic in lat. 170° 18′ S. It flows at first in a southerly direction and afterward in a westerly direction. In its lower course it forms the boundary between the Portuguese and German territories in that region. At the mouth are sandbanks, and farther up several cataracts.

Cunner, or **Chogset** (*Ctenolabrus adspersus*), one of the commonest of shore fishes on rocky ledges along the New England coast, and found from Virginia to Newfoundland. It rarely attains a length of one foot, and is of a brownish-blue color with yellowish reflections; the teeth are strong and sharp. Although an excellent panfish and a great favorite with the boy angler, its great numbers and its boldness render it a great pest to the professional fisherman, whose bait it continually strips from the hooks.

Cunningham, Allan, Scottish poet and miscellaneous writer: b. Keir, Dumfriesshire, 7 Dec. 1784; d. London 30 Oct. 1842. When a youth he served as an apprentice to a stonemason; but later became a reporter in London, and wrote: 'Sir Marmaduke Maxwell,' a dramatic poem, and 'Lord Roldan' and 'Paul Jones,' interesting but rather theatrical romances. Other works are: 'Traditional Tales of the Peasantry' (1822); 'The Songs of Scotland, Ancient and Modern' (1825); 'Lives of the Most Eminent Painters, Sculptors, and Architects' (1829–33). He will be longest remembered for his song, 'A Wet Sheet and a Flowing Sea.'

Cunningham, John F., Roman Catholic bishop; b. Irremore, county Kerry, Ireland, July 1842. He was graduated at St. Benedict's College, Atchison, Kan., 1860; studied theology in Milwaukee, Wis., and was ordained priest at Leavenworth, Kan., 1865. He was pastor at Fort Scott, Kan., 1865–8; Lawrence 1868–76; Topeka 1876–82; rector of Leavenworth Cathedral 1882–98, and was consecrated bishop of Concordia, Kan., 21 Sept. 1898.

Cunningham, William, English historical writer and clergyman: b. Edinburgh 29 Dec. 1849. He was educated at Edinburgh and Cambridge and took orders in the Anglican Church in 1873. He was chaplain of Trinity College, Cambridge 1880-91, and lecturer there from 1891; was professor of economics at King's College, London, 1891–7, and was lecturer on economic history at Harvard University in 1899. He has published: 'Growth of English Industry and Commerce'; 'Outlines of English Industrial History'; 'Western Civilization'; 'Modern Civilization in Economic Aspects'; 'Use and Abuse of Money'; 'Alien Immigrants to England.'

Cunninghame-Graham, Robert Bontine, Scottish writer: b. 1852. He was educated at Harrow and sat in the House of Commons for North Lanarkshire 1886-92. He has published: 'Notes on the District of Menteith' (1895); 'Father Archangel of Scotland and other Essays' (1896); 'Aurora la Cujini' (1898); 'Journey in Morocco' (1898); 'The Ipane' (1899); 'Thirteen Stories' (1900); 'A Vanished Arcadia' (1901).

Cunningham'ia, a genus of the *Coniferæ*, so named in honor of the botanists and travelers I. and A. Cunningham. The single species of the genus *C. sinensis* is a tall and handsome tree, native of China and Cochin-China, with leathery leaves somewhat resembling those of the *Araucaria* (q.v.). It is too tender for the ordinary temperate climate, but is used in favorable localities as an ornamental tree, though never seen in its full beauty except in its native country, as the transplanted specimens must be small enough to be protected from the slightest frost. It is therefore known generally as a house-plant.

Cup, a name for a refreshing beverage, made usually of wine, soda-water, ice, and flavoring ingredients, such as claret cup, champagne cup, etc.

Cup-and-saucer Limpet, shells of the gasteropod genera *Calyptraea* and *Crucibulum*, so called from having in the middle of the inside of the shell a cup-like process, the shell proper constituting the 'saucer.' *Hipponyx* is another form. *Crucibulum striatum* occurs off shore on our coast.

Cup, Divination by, a mode of foretelling events, in use among the ancient Egyptians, and still surviving in some of the rural districts of England and Scotland. In the East, one method was to put small pieces of gold, silver, and precious stones engraved with mystic characters into a cup of water, then to invoke the infernal powers, who replied by some signs in the cup. By the modern method, a person's fortune is foretold by the disposition of the sediment in his teacup after pouring out the last of the liquid.

Cup-sponge. The cup-sponge of Turkey (*Spongia adriatica*), also called the Levant toilet-sponge, is one of the finest sponges brought from the Mediterranean Sea. See SPONGE.

Çupay, soo-pā, or **Supay** ("the shadow"), the Peruvian god of the dead, the Pluto of their pantheon, corresponding to the Mictla of the Mexicans. He was supposed to rule the land of shades in the centre of the earth. To him went all souls not worthy to become the sun god's associates.

Cupel, kū'pĕl or kūp'ĕl, a shallow earthen vessel, made of bone ashes, and extremely porous, used in assays to separate the precious metals from their alloys. The process of cupellation consists in fusing an alloy of a precious metal, along with a quantity of lead, in a cupel. The lead is easily oxidized, and at the same time promotes the oxidation of other metals, and vitrifies with their oxides. The foreign metals are thus removed; the vitrified matter is absorbed by the cupel, or is driven off by the blast of the bellows as it collects on the surface; and the precious metal at length remains pure. The cupel is described in terms almost identical with those of the present time in one of the oldest extant mediæval works on chemistry.

Cupid, in Roman mythology, the god of love, similar to the Greek Eros, the son of Mercury and Venus. He is usually represented as a winged infant, naked, armed with a bow, and a quiver full of arrows. Sometimes he was represented with a helmet, a spear, and a buckler, intimating that even Mars himself owns the superiority of love. His power was generally shown by his riding on the back of a lion, or on a dolphin, or breaking to pieces the thunderbolts of Jupiter.

Cupola, in architecture, a hemispherical semi-elliptical roof, built of stone, timber, metal, or glass. The ancient cupolas were hemispherical, and were used with great effect by the Romans. The greater part of modern cupolas are semi-elliptical, cut through their shortest diameter. Of ancient cupolas, the finest is that of the Rotunda or Pantheon at Rome, erected under Augustus, and still perfect; of modern construction, some of the handsomest are those of Saint Peter's at Rome, of Saint Paul's, London, the Hotel des Invalides, Paris, Santa Maria da Fiori at Florence, Saint Sophia at Constantinople, and the national capital at Washington, D. C. The term is also applied to any small structure rising above the roof, not necessarily spherical, but of any shape.

Cupping, the process of applying small cups to the skin for the purpose of causing local irritation or local abstraction of blood. The cups that are ordinarily employed are small glass half-spheres, connected with a rubber bulb by means of which the air may be exhausted and the cup applied. This results in drawing up into the cup a certain amount of skin area, which subsequently becomes filled with blood. The local abstraction of blood, however, does not explain the physiological action of the cups. The action is really that of an irritant, which, affecting the skin area, causes a reflex effect on a related visceral area somewhere in the body. The cups are termed dry cups or wet cups according to whether the skin is punctured or unpunctured. With wet cups the blood is drawn from the skin directly. Cups are useful in the early stages of acute congestion such as occurs in the lungs, or they may be applied to other organs. Cupping may also be performed by the ordinary tumbler in which a small amount of alcohol is permitted to burn. This heats the air and thus causes, on cooling, a partial vacuum when the cup is applied to the skin.

Cupples, George, Scottish sketch and story writer: b. Legewood, 2 Aug. 1822; d. 7 Oct. 1891. His best known work is 'The Green Hand,' a stirring tale of the sea.

Cupples, Samuel, American manufacturer: b. Harrisburg, Pa., 13 Sept. 1831. At the age of 12 he was employed in a grocery store in Pittsburg, but removed to Cincinnati in 1846, where he entered a wooden-ware establishment. In 1851 he was sent to Saint Louis to establish a branch house there, which as the house of Samuel Cupples & Company became widely known. In 1883 this was recognized as the Samuel Cupples Woodware Company, of which its original founder is still president. It is the largest business of its kind in the world, its trade equaling in amount that of all other wooden-ware houses in the United States. He has taken a warm interest in education and has done very much to sustain the school system of Missouri. He was the original promoter of the Saint Louis Manual Training School and his gifts to educational institutions have amounted to several millions. See CUPPLES STATION.

Cupples Station, a railway junction in Saint Louis established by Samuel Cupples (q.v.) and others. Here has been erected an extensive system of railroad warehouses whose basements are traversed by railroad tracks. Merchants are thus enabled to receive and re-ship goods with the expense of handling them reduced to a minimum, the expense and delay of cartage being eliminated from the problem. This vast property has recently been presented by Samuel Cupples and his partner R. S. Brookings, to Washington University, this institution collecting all rentals therefrom.

Cuprite, kū'prīt, native cuprous oxide, Cu_2O. It is the richest of the copper ores and occurs earthy, massive and granular, and also

in beautiful isometric crystals which in the variety chalcotrichite are elongated into capillary crystals. Usually it is translucent, of adamantine luster and very dark cochineal-red color. Its hardness is 3.5 to 4 and specific gravity about 6. Among its many important localities are Chessy in France, Cornwall in England, South Australia and Chile, and in the United States at Bisbee and Morenci in Arizona.

Cur, a dog of any kind not highly valued, and in this way often particularly appropriated to dogs of mongrel breed. Naturalists use the term cur as the common designation of many races, of which the terrier may be considered as the type.

Cura, koo'rä, also **Ciudad de Cura**, Venezuela, a city situated 56 miles west of Caracas and a short distance from Lake Valencia, in the old state of Miranda (now separated into the states of Rivas, Guárico, and Miranda). It was founded in 1730 by Juan Bolivar y Villegas. The site of Cura is 1,600 feet above sea-level at the foot of a steep hill; an extensive valley, watered by two streams, outspreads before it. A record of its temperature shows as the maximum 87° F.; minimum 72°; mean annual 79° F. Owing to its proximity to the savannas of the Guárico, and the surrounding agricultural and grazing districts, with their plantations of sugar-cane, coffee, cacao, cotton, indigo, etc., as well as herds of cattle, Cura is a thriving little place. Pop. somewhat more than 10,000.

Curaçao, koo-rä-sä'ō or kū'ra-sō, an island, one of the Dutch West Indies, in the Caribbean Sea; 46 miles north of the coast of Venezuela; between lat. 12° 3′ and 12° 24′ N., and lon. 68° 47′ and 69° 16′ W.; stretching northwest to southeast; 36 miles long and 8 miles broad; capital Wilhelmstad. The chief minerals are iron and copper (but the mines are not developed), and salt. The cocoa-palm, banana, and three varieties of the orange — from one of which varieties the far-famed Curaçao liqueur is made — grow abundantly. Curaçao was settled by the Spaniards early in the 16th century; it was taken in 1632 by the Dutch; and was captured by the British in 1798, but restored at the Peace of Amiens. It was taken again by the British in 1806, and finally ceded to Holland at the general peace in 1814. Pop. (1900) 30,042; including the dependencies, 51,943.

Curaçao, or **Curaçoa**, the genuine Dutch liqueur of this name, so much esteemed for its taste and aroma, is prepared from a peculiar kind of bitter oranges growing in Curaçao, which fall from the tree before they are ripe, and which have an extremely persistent aromatic odor and taste. The rind of the orange is macerated, the white pulpy matter scraped off, and the yellow part, along with yellow fresh oranges, steeped in strong alcohol for 24 hours. The liquor is distilled and rectified, about half being collected, and this is mixed with a syrup made of fine white sugar. To this is added a certain quantity of curaçao infusion, which is a stronger alcoholic extract of the peel containing sugar, and then a certain proportion of water. The fluid is clarified and allowed to settle. The finest quality has a deep yellow color, which is sometimes improved by a few drops of tartaric acid.

Curari, koo-rä'rĭ, **Curare**, **Ourari**, etc., an arrow poison widely used by the natives of South America. Its exact composition is unknown, but it is certain that the juice of some species of *Strychnos* is always present. No species of *Strychnos* that is now known, however, has the same physiological action that curari has. Its method of preparation is kept secret and it is probably true that each tribe has its own method of preparing the poison. The physiological action of curari is unique. It is a type of pure motor paralysant, affecting the motor end organs in voluntary muscles. In death by poisoning from curari, the muscles of respiration becoming paralyzed, asphyxia results. Therapeutically, curari is of secondary service. Its varying composition and uncertain strength make it dangerous, and theoretically it would be indicated only in motor disorders of the voluntary muscles such as convulsive ties, torticollis, hydrophobia, etc. In the treatment of poisoning, artificial respiration is the best procedure.

Curassow, kū-răs'ō, a bird of the subfamily *Cracinæ* and family *Cracidæ*, related to the guan (q.v.) and mound-bird (q.v.), and with these occupying the border between the *Columbæ* and *Gallinæ*, and most often grouped with the latter, but resembling the former in having the hallux on the same level as the other toes. The name is derived from the supposed origin of those first known to Europeans from the island of Curaçao. The curassows are exclusively birds of tropical America and are especially abundant in the forests east of the Andes. They are large, sometimes equaling the turkey in size, with handsome plumage and in some varieties crested head. Usually the trachea of the males forms a loop within the sternum, as in certain cranes, and renders possible the clear ringing voices of these birds. They are chiefly arboreal, but also scratch on the ground for their food, which consists largely of nuts, berries, and tender leaves. Most species also nest in trees and, as the young are precocial, a curious sight is presented by their scrambling among the branches while still in the down. Being highly prized for food, some of the species have been domesticated and are said to hybridize readily with the common barnyard fowl. The genera are *Crax*, with a soft cere and crested head; and about 10 species in Central and South America. The *Nothocrax* has no cere, and the lores, or spaces between the eyes and beak, are naked. *Mutua* is similar, but the lores are feathered; *M. mitu* is a beautiful blue-black species of Brazil and adjoining countries to the north. *Pauxi* contains the well-known *P. galeata* of zoological gardens, in which the frontal region of the head bears a large, deep blue knob. It is a native of the extreme northern parts of South America. Interesting accounts of these birds will be found in Bates, 'Naturalist on the River Amazon' (1863).

Cura'tor (Lat. "care-taker"), in civil law, a term signifying the guardian of a minor who has attained the age of 14. Before that time minors are under a tutor. The guardianship of persons under various disabilities, and of the estate of deceased or absent persons and insolvents, is also committed to a curator. In learned institutions the person who has charge of the library or collections of natural history, etc., is often called a curator.

Curb, a disease in horses consisting of strain of the straight ligament which runs down the back of the hock. It is most common in animals with straight small hocks and sickle hams. Like other strains it occurs from sudden and violent exertion, often proceeding in the lighter breeds from leaping or galloping in heavy ground, and in the heavier, from the effort of keeping back a load while going down a steep incline. Swelling appears on the outer and back part of the joint, about five or six inches below the point of the hock, generally causing lameness, most apparent in trotting, and, in slight cases, usually decreases after the animal has been out for 10 minutes. Fomentations must first be used to allay the irritation and inflammation, and a high-heeled shoe put in. When heat and tenderness disappear, cold applications will be advisable; after which, the enlargement still continuing, a blister may be necessary. From the first all work must be forbidden.

Curbina. See DRUM.

Curculio, ker-kū'lī-ō, an insect-enemy of the plum. See paragraph *Insects*, under PLUM.

Curculionidæ, ker-kū-lī-ōn'ī-dē, the snout-beetles, or weevils (q.v.). One of the most extensive families of coleopterous insects. They belong to the section *Tetramera*, and all the species have a curious snout-like head.

Curcuma, kėr'kū-ma, a genus of the gingerwort and cardamom order. The corm is about as thick as the thumb, and is divided into several parts. The leaves which are about a foot long are lanceolate in form and sheathing. *Curcuma longa* is a turmeric plant, the tuberous rhizomes of which furnish the substance called turmeric (q.v.). This plant is extensively cultivated in southern Asia. *C. amada*, a native of Bengal, is the mango-ginger, which has qualities resembling ginger. From the colorless rhizomes of *C. leucorhiza* is prepared a kind of arrowroot. *C. zedoaria* yields a tonic medicine, and is also used as a food.

Curd. See CHEESE.

Cures, kū'rēz, an ancient town of the Sabines, 25 miles northeast of Rome, whence the Romans, after the people of Cures united with them, came to be called Quirites.

Curfew, kėr'fū, also **Curfeu**, from the French *couvrir*, to cover, and *feu*, fire. The ringing of a bell at nightfall, originally designed as a signal to the inhabitants to cover their fires, extinguish lights, and retire to rest. The practice is said to have been instituted by William the Conqueror, in all probability as a safeguard against fire, but the English in early days regarded the curfew as a badge of servitude. Originally the hour set for the ringing of the curfew bell was 8 o'clock, but it was also rung at 9 o'clock. The bell in each village or community which tolled the curfew became known as the curfew-bell. In certain parts of rural England the custom is still kept of ringing a bell at 9 o'clock.

The curfew bell was introduced into the United States early in the century, but without regularity of practice. About 1880 Col Alexander Hogeland, who has been called "the father of the curfew-law," introduced an ordinance in Omaha, Neb., compelling youths to absent themselves from steamboat landings, railroad stations, and low variety shows. The curfew ordinance, somewhat changed and modified, was adopted in 1894 at Lincoln, Neb. The term curfew-law has since been given to all laws intended to keep young people off the streets after a certain hour, generally 9 o'clock at night. In 1894 at the National Convention of the Boys' and Girls' Home Employment Association in Indianapolis, the adoption of curfew ordinances was urged in view of the great increase in crime among children. Since that time the law has been generally enforced in over 3,000 cities and towns in this country. The officials of many of these towns report a decrease of 80 per cent in the arrest of boys and young men, under the provisions of the law, and former objections to the curfew have ceased. In 1898, a consensus of opinion was taken in 300 towns where the curfew law was in operation and all reports showed that there was a decided improvement in the youth morally and socially.

The curfew law, in general use, provides that all children under 15 years of age shall not be on the streets at night after 9 P.M. in summer and 8 P.M. in winter, without the written consent of their parents or guardians. The law has been endorsed by city officials, commercial associations, school boards and boards of trade in various sections of the country. The enforcement of the law has largely reduced the number of commitments to reform schools as is illustrated at the State Reform School at Boonville, Mo. During two years prior to the adoption of the curfew ordinance at Kansas City, Mo., 47 boys were sent to the reform school while for two years after the adoption of the law only 17 boys were committed from Kansas City. The ordinance has been recognized as a crime-reducer, child protector, and home builder. Benjamin Harrison called the curfew-law, "the most important municipal regulation for the protection of the children of American homes, from the vices of the street, of the present century."

Curi-cancha, koo-rē-kän'chä, the splendid Temple of the Sun, built by the Incas in Cuzco, Peru, on the site now occupied by the church of San Domingo. See CUZCO.

Cu'ria, a certain political division of the Roman people, said to have been established by Romulus; also the place of assembly for each of these divisions. According to Livy, Romulus divided Rome into 30 curiæ, and assigned to each a separate place of meeting. In early times only the members of the curiæ were in possession of the full citizenship of Rome.

Curia Roma'na, the body of officials who under the Pope administer the government of the Roman Catholic Church, or in a wider sense the entire court of the Pope. The relations of the Roman see to the secular powers are conducted through the cardinal secretary of state; under him are nuncios and other diplomatic agents of the Holy See. The Pope acts as the supreme judge in the Church, either through special delegated judges or through regular tribunals, the Rota and Segnatura for causes in the *forum externum* and the Penitentiaria for those in the *forum internum*. In the Roman Chancery are drafted and expedited the bulls and briefs by which the mind of the pontiff is made known to Christendom or to

individuals. The Rota and the Segnatura are tribunals for determination of questions of canon and ecclesiastical law whether in the first instance or on final appeal.

For the different congregations of the College of Cardinals, or the standing committees, see CONGREGATIONS, ROMAN.

Curiatii. See HORATII.

Curicó, koo-re-kō′, Chile, a province lying between Colchagua and Talca. Area 2,915 square miles. It is divided into the departments of Curicó and Vichiquen. Its capital city, also called Curicó, has two commercial banks, several tanneries, and other industrial establishments. The port of Llico is on the Lake of Vichiquen. Numerous irrigating canals are derived from the Teno and Lontue, which unite to form the Mataquito River. Cereals, vegetables, wine, cattle, timber, and fruits are among the products; there are also a few copper, silver, and gold mines in the Cordillera and the coast range of hills, and the annual output of salt from the estuaries of the lakes of Vichiquen, Boyeruca, and Bucalemu exceeds 25,000 tons. The State Central Railroad crosses the province. Pop. (province) 115,000, (city) 15,000.

Curie, Pierre and Marie, distinguished physicists, the former French and the latter Polish, of whom a writer in the *Scientific American* has said that "they afford an example of a most interesting collaboration, since it concerns a husband and wife, both of high scientific attainments, who aided one another with their efforts and knowledge in the arduous path that finally led to the production of pure radium." M. Curie was born in 1859; d. Paris, 19 April 1906, and at the age of twenty years began to make independent scientific researches. In 1895 he received his appointment as professor of physics and chemistry, having discharged the duties of *chef de travaux* up to that time; and the future husband and wife met as teacher and pupil. Marie Sklodowska (born at Warsaw Nov. 1868) completed the usual course of study at the Warsaw *gymnasium* about 1884; afterward worked in the laboratory of physics of the Industrial Museum; in 1891 went to Paris and obtained a licentiate's degree in the mathematical sciences (1893), taking a degree in physical and chemical sciences two years later. Before M. Pierre Curie married her she had become instructor in physics at the High School of Sèvres. She entered the path marked out by her husband, and together they continued their experiments in the laboratory of the school of physics and chemistry. Toward the end of 1898 the Academy of Sciences received a communication in which Professor and Mme. Curie positively confirmed what they had previously announced with respect to a new and strongly radioactive substance derived from pitchblende. In the first place they found an element to which (in remembrance of the country of Marie Sklodowska) they gave the name *polonium;* then their collaboration was rewarded by the discovery of radium (q.v.)

Curitibá, koo-rē-tē-bä′, Brazil, the capital of the state of Paraná, situated on a plateau 2,890 feet above sea-level. It is about 80 miles west of the port of Paranaguá. A wagon-road and a railroad, the latter built in 1885, connect the city with the ocean. A line of steamships running directly between Paranaguá and Hamburg, Germany, is subsidized by the state. From Paranaguá and the neighboring port of Antonina are exported woods, maté, sugar, and cereals. Pop. about 15,000. See also PARANÁ, the state.

Curlew, kêr′lū, shore birds of the genu *Numenius*, belonging to the snipe family (*Scolopacidæ*, q.v.). In this genus the bill is long, slender, and arcuate, and the toes are rather short, thick, and margined. Most of the species are of large size for the family, and about 15 are found throughout the world.

The long-billed curlew (*N. longirostris*) is the largest species, its total length sometimes exceeding two feet. It is found throughout temperate North America, but is rare in the New England States. In the interior it is common throughout the Mississippi valley, where, as well as in the south Atlantic States, it breeds, laying three or four eggs on the ground in meadows or prairies. Like other species its principal food consists of worms, crustaceans, and insects, but vegetable matter is also eaten. The Hudsonian curlew (*N. hudsonicus*) is smaller, with the bill scarcely more than one half as long and the color of a less rufous tone than the last. It is more a bird of the North, breeding in the Arctic regions, and migrating through the United States. The common curlew, Eskimo curlew, or dough-bird of gunners, (*N. borealis*) is still smaller, having a total length of 12 to 15 inches, and a bill of only 2 or 3 inches. This bird is remarkable for its extensive migratory movements in the spring and fall. Like the Hudsonian curlew it breeds in high northern latitudes, but winters still farther south in tropical America. During the migrations it abounds along the eastern seaboard of the United States. Consult: Elliot, 'North American Shore Birds' (1895).

Curling, a Scottish game played on the ice, with large smooth stones of a hemispherical form, with an iron or wooden handle at the top, which the players slide from one mark to another. The space within which the stones move is called the "rink," and the hole or mark at each end the "tee." The number of players upon a rink is 8 or 16—8 when the players use 2 stones each, and 16 when they use 1 stone each. The object of the player is to lay his stone as near to the mark as possible, to guard that of his partner which has been well laid before, or to strike off that of his antagonist. When the stones on both sides have been all played, the stone nearest the tee counts one, and if the second, third, fourth, belong to the same side, each counts one more.

Curly-grass, a common name for a fern (*Schizæa pusilla*), the typical genus of the climbing fern family. The plant is rare, being occasionally found in wet soil in the pine barrens of New Jersey and in Nova Scotia. The climbing fern family has 16 genera, of wide geographical distribution, the 2 American genera being *Schizæa*, as above, and *Lygodium*, represented by the Hartford fern (q.v.).

Curran, Charles Courtney, American artist: b. Hartford, Ky., 13 Feb. 1861. He studied art in Cincinnati, the New York Art Students' League, and the Académie Julien in Paris, France, receiving an honorable mention in the Salon of 1890. He has been awarded several of the prizes of the National Academy of Design, and received medals at the World's Columbian Exposition and the Cotton States International Exposition.

Curran, John Philpot, Irish orator: b. Newmarket, near Cork, 24 July 1750; d. Lon-

don 14 Oct. 1817. He was educated at Trinity College, Dublin, after which he went to London and studied at one of the inns of court. In 1784 he was chosen a member of the Irish House of Commons. His abilities now displayed themselves to advantage, and he became the most popular advocate of his age and country.

Curran possessed talents of the highest order. His wit, his drollery, his eloquence, his pathos, were irresistible; and the splendid and daring style of his oratory formed a striking contrast with his personal appearance, which was mean and diminutive. See Davis, 'Life of Curran' (1846); Phillips, 'Curran and His Contemporaries' (1850).

Currant, originally, the small black, seedless raisins popularly used in cookery, and so named from the Greek city of Corinth, where they first became commercially important; by extension, various species of the genus *Ribes* and their fruits. The former belongs to the genus *Vitis* (see GRAPE) of the natural order *Vitaceæ* or *Ampelidæ*; the latter to the *Saxifragaceæ*. Only the thornless species of the latter genus which bear grape-like clusters of smooth fruits are called currants; the spiny species are known as gooseberries.

The most widely cultivated species is unquestionably the red currant (*R. rubrum*) which has developed several white horticultural varieties as well as numerous red ones which are commercially important, both in the fresh state and when manufactured into jelly. The black currant (*R. nigrum*) is next in importance as a fruit but is less popular in America because of its peculiar flavor, less prolific habit, and smaller range of usefulness. The first is a native of the north temperate zone, the second, of Europe and Siberia. The American black currant (*R. floridum* or *americanum*) resembles the common black currant but, though sometimes found in gardens, is little esteemed. The flowering currant (*R. aureum*), an American species, has produced several horticultural varieties but is not cultivated for its fruit, which ripens very unevenly, but for its bright yellow sweet-scented flowers which appear in the spring. Several other species are grown for ornament, the most notable of which is the red-flowered currant (*R. sanguineum*) which is found on the Pacific coast from British Columbia to South America. It has developed several varieties which are all attractive in flower but which bear rather dry, bitter berries, erroneously reputed poisonous. Only the first three species are economically important, and that only in the North or in the higher altitudes of the South, where the hot summers injure the bushes. In the dry plains region they succeed only under specially favorable conditions such as irrigation and partial shade, etc. Several unrelated species of plants are called currant, but compared with the above are unimportant.

The currant thrives best in cool, rather humid climates, upon well-drained but moist strong clayey loams, and with less attention to cultivation, pruning, etc., than any other small fruit. However, it will respond liberally to good treatment, and deserves better attention than it usually receives. The plants are generally propagated by means of hard wood cuttings which are transplanted to the field when one or two years old. The usual distances for planting are four by six feet, upon land well prepared by plowing and harrowing. The bushes are cultivated until mid summer, when a cover crop is sown to be plowed under the following spring. Annually, two or three new stems should be allowed to grow, preferably from below ground, at the centre of the bush, and when this wood has borne fruit twice (that is, when three years old) should be cut out, since younger wood is more productive and less likely to become infested with insects and disease. On this account, training to the tree form is not recommended. A plantation should continue to be commercially profitable for 6 or 10 years after coming into bearing and should yield 100 bushels an acre if properly cared for. Yields of 250 bushels have been reported. Individual plants in gardens should produce from two to four pounds.

Of the many insects that attack the plant, the currant sawfly or currant worm (*Nematus ribesii*) is the best known. It is a European four-winged fly somewhat larger than a large housefly, which lays its eggs upon the midribs of the under sides of the leaves, particularly those near the ground, in early spring. The green, black-dotted worms frequently do considerable damage before their presence is suspected. Spraying with arsenites or hellebore as soon as the leaves appear and at intervals of about a week is a positive remedy. As a result of neglect, however, the bushes are frequently defoliated. A long-horned beetle (*Pscnocorus supernotatus*) lays its eggs upon the shoots and branches into which the larvæ burrow and emerge as adults during late spring of the following year. When troublesome the bushes should be heavily pruned during the winter and the prunings burned. This treatment will also destroy another species of borer, the adult of which is a moth (*Scsia tipuliformis*). No practicable remedy has been discovered for the currant fly (*Epochra canadensis*) which sometimes is seriously troublesome, since it attacks the fruit, which ripens prematurely from the presence of larvæ beneath the skin.

All leaf diseases of the currant, the best known of which are anthracnose (*Gloeosporium ribis*) and leaf spot (*Septoria ribis*), may be controlled by thorough spraying with a standard fungicide (q.v.). The former of these diseases is characterized by small black spots on the upper surfaces of the leaves and white ones beneath; the latter has black-centred white spots. The leaves fall prematurely in each case. The currant tubercle, a disease which attacks the whole plant, has become locally destructive in some of the Eastern States. The leaves wilt, the fruit colors prematurely, the clusters become small and few, and both foliage and fruit shrivel and fall. The plant soon dies. No remedy is known except prompt digging and burning. No diseased plants should be used for propagation because the disease seems to permeate the whole plant.

Consult: Card, 'Bush Fruits' (1898); Bailey, 'Cyclopedia of American Horticulture' (1900–02).

Currant Insect-pests. The worst pests of currants (and of gooseberries) are the larvæ of two sawflies (q.v.). The most destructive of these is *Nematus ventricosus*, imported into this country about 1800, and since become very widespread. The female, which is bright honey



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yellow with the head black, lays her cylindrical, transparent, whitish eggs in May in regular rows along the rims of the leaves on the under side. The embryo escapes from the egg within four days, and in the form of a pale-green worm which begins to eat out holes in the leaves, grows rapidly and after a few days drops to the ground, burrows among the roots, forms a cocoon and pupates. Two broods are raised. There are some 50 species of this genus in the United States, all of which are harmful. Another sawfly (*Pristiphora grossulariæ*) does great damage in the North and West. This female is shining black, with the head and legs yellow. It is later than the other; its worms, which are pale-green, with a black head and a brown side-stripe, appear late in June. Next to these the caterpillars of the yellowish, dark-spotted phalænid moth, *Eufitchia ribearia*, is probably the worst of our "currant worms," and in Great Britain is a noted pest of the gooseberries. They defoliate the bushes as soon as the leaves begin to expand. Another moth, *Ægeria tipuliformis*, of the family *Zygænidæ*, is called the "currant-borer" because its larva bores into the stems in order to pupate, and thus blasts the life of the stem. It is an agile, dark-blue moth less than an inch in expanse, and flies about in the July sunshine. It is an imported pest, and damages the gooseberries and currants of both continents. Another destructive borer is the grub of a small black long-horned beetle (*Psenocerus supernotatus*), which tunnels and kills the branches. To combat these pests, use handpicking and hellebore for the leaf-eaters; trim away in winter all dead and dying twigs, which may contain borers; and in transplanting, free the roots from all possible cocoons.

Cur'rency, any medium of exchange facilitating trade. Originally all exchanges must have been directly by barter. In barter, however, very often it would be difficult to find two persons whose disposable goods suited each other's needs. So some special commodities in general esteem and demand were chosen as a medium of exchange and common measure of value, the selection varying with the conditions of social life. In the hunting state furs and skins have been employed by many nations; in the pastoral state sheep and cattle are the chief negotiable property. Articles of ornament, corn, nuts, olive-oil, and other vegetable products, cotton cloth, straw mats, salt, cubes of gum, bees'-wax etc., at various times have been employed to facilitate exchange. These were not entirely satisfactory, for any suitable medium not only must possess utility and value, but be portable, not easily destructible, homogeneous, readily divisible, stable in value, and cognizable without great difficulty. The metals commend themselves as best satisfying these requirements, and in all historic ages gold, silver copper, tin, lead, and iron have been frequent materials of currency. The primitive method of circulating them appears to have consisted simply in buying and selling them against other commodities by a rough estimation of the weight or size of the portions of metal. Sometimes the metal was in its native state, at others in bars or spikes. The earliest money was stamped on one side only, and rather of the nature of stamped ingots than coins as we know them. The need of preventing counterfeiting, and any fraudulent subtraction of metal from the coin, of removing as far as possible anything likely to occasion loss of metal in the wear and tear of usage, and striving after an artistic and historical monument of the state issuing the coin brought about elaboration of designs to cover the whole of a given portion of metal, and nicer determination of quality, size, degree of relief, inscription, etc. While, however, metallic money of a guaranteed standard value was at an early period found to facilitate in a high degree the mechanism of exchange, it was speedily discovered that it was possible in large part to replace the standard gold or silver or copper coins by various forms of currency of a representative character. Standard money depended solely for its value in exchange upon the value of the material of which it was composed; its metallic value and its nominal value were coincident; representative money derived its value from a theoretic convertibility at will into the standard coin. Gradually a series of devices came to be employed to further the interchange of commodities with the least friction and the least possible actual use of the coinage except as a standard and common denominator of value in terms of which exchanges were made. The use of actual specie was found to involve a loss of interest and a risk of more serious loss, and a paper currency based upon credit offered the readiest solution of the difficulty. In this way bank-notes, bills of exchange, and checks — warrants or representative documents convertible, if desired, into standard coin — took their place alongside the metallic currency, partly displacing it, partly extending and supplementing it.

The requisites of circulation are that monetary issues, whether of coin or paper, be from a recognized or official source, and that they admit of being freely returned when necessary to that source. The certification of the fineness of the masses of metal circulating in a community, and the protection from adulteration and fraud, clearly falls among the necessary acts of police. It is still argued, as by Herbert Spencer in his 'Social Statics,' that the coinage should be left to the ordinary competition of manufacturers and traders; but where this occurs currency uniformly becomes debased, and it is generally held, in accordance with the maxims of civil and constitutional law, that the right of coining is a prerogative of the state. In the matter of state supervision two precautions are necessary; that standard coins shall be issued as nearly as possible of the standard weight, and that all coin worn below the least legal weight shall be withdrawn from circulation. The ground for these precautions is to be found in the broad general principle relating to the circulation of money, and known as Gresham's Law (q.v.) that bad money invariably drives good money out of circulation, the heaviest coins being selected for exporting, hoarding, melting, conversion into jewelry, gold-leaf, etc. The law holds good with regard to coins in one kind of metal, and to all kinds of money in the same circulation, the relatively cheaper medium of exchange being retained in circulation, while the other disappears. Of the various systems of metallic currency the first adopted was that known as the single-legal-tender system, in which the state issued certified coins in one metal only. It was

tained, however, that in such cases the people invariably coveted for convenience coins of other metals, and there naturally arose out of this the adoption of a double or multiple legal tender system, in which coins were issued in different metals at a fixed rate of exchange. To evade difficulties arising from the possession of two or more metals as concurrent standards of value, with the constant tendency of one or other to become more valuable as metal than as currency, a third system, the composite-legal tender, came into existence, in which coins of one metal were adopted as the standard of value, and token coins only issued in the other metals for the payment of small amounts. The last system is that now prevalent in the United States, but the double-legal-tender system, to which the French have long adhered has been revived in a more philosophic form by economists, and has found an increasing number of advocates for its universal adoption. See BIMETALLISM.

The circulation of representative money differs from that of standard metallic money in that it only circulates within the district or country where it is legally or habitually current. In the payment of debts to foreign merchants the only money which can be exported is standard metallic money. Hence Gresham's law holds with regard to paper-money, which is, like light and debased coins, capable of driving out standard money. Examples of this are to be found in the suspension of specie payments by the Bank of England between 1797 and 1819, and in the history of the French assignats at the time of the Revolution. The various methods by which the issue of paper-money may be conducted are exceedingly numerous and a matter of interminable debate. The state may constitute itself the sole issuer of representative money on the same lines as it constitutes itself sole issuer of metallic money, or it may allow corporations, companies, or private individuals to issue representative money under legislative control.

The question as to the duty of a government in this respect has been much obscured by the want of a clear apprehension of the distinction between a real and a nominal currency. The doctrine of orthodox writers on the currency of the absolute convertibility of the bank-note, by which is intended a convertibility provided for by the action of government, is held by some writers to proceed on an altogether exaggerated and inaccurate notion of the functions of a government. Another idea, that the issue of paper-money ought to be wholly controlled by government, or ought to rest entirely upon government credit, places a high degree of faith in the trustworthiness of governments, and is held by many to misconceive the nature and objects of a paper currency. The tendency has been to regard the issue of notes not so much as allied to the commercial operation of drawing bills, but as analogous to the state function of coinage. In Scotland, on the other hand, a perfectly sound currency was furnished by banks acting, until 1845, on their own unrestricted discretion, and the prevailing tendency is still toward a maximum of freedom in the issue of representative paper money.

Credit Currency.—Asset currency and credit currency are two things that mean the same thing. An asset or credit currency would, in this country, be the issue of notes by the national banks, these notes to be based upon the general assets of the banks, that is to say, their resources in specie and United States notes, their loans and discounts, their holdings of bonds and other securities, and their real estate, to which should be added their capital and surplus, and possibly the personal liabilities of the stockholders. Capital is usually called a liability by banks, though it is in reality an asset so far as the depositors are concerned. It is a liability of the bank only in its relations to its stockholders. Asset currency is, therefore, a currency based upon the credit of a bank as measured by its capital and resources, and its reputation for honest and efficient management. The present bank-note circulation of the United States is a bond-secured currency, and in a strict sense, might be termed a credit currency, for notes thus issued are promises to pay secured by bonds, which are promises to pay. But it is needless to say that the government's promise to pay is the highest form of security. So that neither it nor the bank-note is in practice credit currency.

The national banking system was an outgrowth of the Civil War, and at least one of the motives for securing note circulation by deposits of bonds was to insure a market for the bonds issued by the government to defray the cost of the Civil War. But, with the establishment of peace and the rapid development of the country in wealth and power, the credit of the nation has increased, and there is no longer any need of creating a market for government bonds, though, of course, if the law was changed so that they were no longer required to secure circulation and government deposits, their price would decline. But, the motive for a bond-secured circulation no longer exists. Our government could sell its bonds even if they were not required by the banks. The public debt, notwithstanding the bonds issued in the second Cleveland administration to keep the government on a gold basis, and those issued by the McKinley administration to defray the cost of the Cuban war, has been greatly reduced since the civil conflict. It is the settled policy of the treasury to reduce the public debt by at least $50,000,000 a year. But regardless of the motive for securing bank-note circulation by deposits of bonds, the result has been to create an absolutely safe currency. A national bank-note is always sure of redemption. The failure of a bank does not impair the security of its outstanding notes. These have behind them the power, the wealth, the credit of the whole country.

But, security is not the only essential of a currency. It must have another quality, namely, elasticity. The advocates of a credit currency claim that it would be as safe as a bond-secured circulation, and at the same time have the quality of elasticity which the present bank-note circulation has not. There are times when an expansion in note circulation is desired, as for instance, when the crops are being harvested and moved to the markets. But when this demand for currency is passed, the door should be open for a speedy retirement of bank-notes. Any note circulation in excess of actual needs would have the demoralizing effect of inflation. There must be every facility for quick expansion and equally quick contraction. The latter is fully

as important as the other. If necessary it might be made compulsory by making the tax upon circulation so large that the moment the demand for notes ceased it would be unprofitable for the banks to attempt to force them into circulation, and they would thus be reduced in lawful money and retired. It is scarcely necessary to say that a redeemable bank-note circulation absolutely sure, and perfectly elastic, so as to conform to the varying needs of the country, constitutes an ideal currency. One of its merits raising it, even above gold coin in actual use, is the economy and safety the bank-notes secure in transportation. They can be sent long distances with small expense, and are a most convenient form of money. Even if not made a legal tender in payment of debts they would be universally accepted for such a purpose because of the confidence felt in them. See BANKS AND BANKING; BILLS; COINAGE; DOLLARS; GOLD; MONEY.

Currency Bill of 1900 (15 February), the culmination of the many years' struggle between United States parties over the standard of value; ending in the complete victory of the gold party, 46 to 29 in the Senate on the adoption of the bill. The provisions are: The unit of value to be the gold dollar of 25.8 grains, 9-10 fine; all United States money to be maintained at a parity with it, and all government paper-money to be redeemable in gold. A redemption fund of $150,000,000 to be set apart not to fall below $100,000,000, and if necessary replenished by sale of bonds at not over 3 per cent. As fast as silver dollars are coined, an equal amount of treasury notes to be replaced by silver certificates; gold certificates on certain conditions to be issued against the gold in the treasury. No United States or treasury notes to be of less than $10, nor silver certificates of more than $10. The bonded debt may be refunded in 30-year 2 per cent gold bonds, at not less than par. Any national bank may issue circulating notes up to its paid-up capital, by depositing an equal amount of national bonds.

Current, a flow or stream of a body of water, more or less rapid, by which vessels are compelled to alter or modify their course or velocity, or both, according to the set or drift of the current. Rivers have currents varying in strength, chiefly according to the inclination of the bed down which they flow.

There are currents in the sea vastly broader than any existing even in the largest rivers, while the length is indefinite, for each is so connected with all the rest that the whole surface waters of the ocean resemble a very much curved and contorted chain, which, notwithstanding the excessive irregularity of its figure, so moves as perpetually to return into itself. In the Atlantic the chief currents were long held to be, first, the Gulf Stream, from the Gulf of Mexico in a northeast direction, a branch ultimately reaching the Azores and another the British Islands. This current was counterbalanced by a Polar one moving southwest and carrying escaped icebergs in the direction of America. The Gulf Stream was partly fed by the Equatorial current, running from the coast of Africa to the Caribbean Sea. Dr. Carpenter has shown that not merely the Gulf Stream, but a great part of the surface of the Atlantic, is moving north. An Antarctic drift current originates a great Equatorial current in the Pacific Ocean, which flows north around the west shores of South America, and then west through the Pacific, filling the entire tropics. Strong land currents sweep from it round east Australia, through the China seas, and by the coast of Japan.

The movement of currents from warmer or colder regions, or *vice versa*, modifies the temperature of the several regions through which they pass. Thus the Equatorial current which crosses from Africa to Brazil and the Caribbean Sea, being 3° or 4° cooler than the ocean at the equator, diminishes the heat at the latter region. The Gulf Stream, on the contrary, brings with it heat, the temperature of the Mexican Sea being 7° above that of the Atlantic in the same latitude. Among the causes of currents on a greater or less scale may be enumerated the winds, the tides, the evaporation produced by solar heat in certain places, and the expansion and contraction of water by heat and cold.

The technical language in which the flow of water and its channels are known and described is as follows: The bed is the water-course, having a bottom, and two sides or shores. When the latter are described as right- or left-hand, going down stream is assumed. The transverse section is a vertical plane at right angles to the course of the current. The perimeter is the length of this section in the bed. The longitudinal section or profile is a vertical plane parallel to the course of the flowing water. The slope or declivity is the mean angle of inclination of the surface of the water to the horizon. The fall is the difference in the height at any two points of determinate distance apart, as, for instance, eight inches to the mile. The line of current is the direction of maximum velocity. The mid-channel is the deepest part of the bed. The velocity is greater at the surface than at the bed. The surface is higher in the current than at the shore when the river is rising, lower than at shore when the river is falling. The direction is the set of the current; the rate is the drift of the current. For electric current, see ELECTRICITY.

Current River, a river of Missouri, rising among the Ozark Mountains in the southern central part of the State, flowing southeast and south into the Black River in Arkansas; length 250 miles. It is navigable for the greater part of its length.

Currents, Ocean, are phenomena of the highest importance in practical navigation. They are streams or rivers of the ocean, and, like the rivers of the land, accelerate or retard the course of the mariner according as the vessel's course is with or against the direction of the stream. With extended navigation of the most distant waters of the globe, increasing attention has naturally been bestowed on the subject of currents, with a view not merely to map down their various courses, but also to elucidate the causes to which they owe their origin. Their recognized influence upon the climates of maritime regions — an influence which extends far inland — gives them additional interest as belonging to the subject of physical geography, of which study, indeed, they constitute one of the most important chapters.

Of the various theories which have been framed with a view to account for the existence

of currents, the axial motion of the earth, and the varying densities of the sea under different parallels, have in nearly all cases formed a part. The theory of a circuit maintained between the equatorial and polar waters, due to their varying density, is distinctly stated by Lyell ('Principles of Geology') and by Maury ('Physical Geography of the Sea'). This theory has within a recent period engaged renewed attention, and has undoubtedly received additional strength from the interesting researches of Dr. Carpenter, who, with great ingenuity and by exceedingly simple means, has given experimental confirmation of its sufficiency as a vera causa. Other causes — among them the earth's axial movement from west to east, and the perennial winds of tropical latitudes, combined with the shape of the continents — also operate in the production of the ocean streams, and give special direction to their movements.

Sea water, unlike fresh water, which has its maximum density at a temperature of 39° or 40° F., continues to increase in density down to its freezing-point, about 25° F. The waters within two extensive areas of the globe, that is, the polar regions of either hemisphere, owing to their generally low temperature (which during a large portion of the year exhibits an intensity of cold of which it is difficult to realize an adequate conception, but of which the polar ice and the huge icebergs derived thence are the unfailing evidence), have a density many degrees in excess of that belonging to the waters of the tropical belt. This difference, though subject to some amount of seasonal modification, is yet permanent, since the brief summer heat of high latitudes penetrates but a little way below the surface, and can scarcely affect the mean temperature of the water at even a moderate depth. There is thus, in either hemisphere, an area within which the waters of the ocean are colder, and hence, by many degrees, denser than within the belt of the tropics. The natural result is a tendency of the colder and heavier water to sink, and to diffuse itself over the lower portion of the ocean-bed, and a movement of the warmer and lighter water in the direction of the surface, over which it tends to become diffused. In other words, the colder waters will move beneath the surface in the direction of the equator; and the warmer waters will flow along the surface in the direction of either pole. Hence, in either half of the globe, two great and opposite currents — a cold current flowing from the pole toward the equator, and a warm current flowing from the equator in the direction of the pole. The means by which Dr. Carpenter illustrates this natural movement on the part of fluids, or portions of the same fluid, of various densities, in contact with one another, and with free movement between their various parts, consists simply in placing at one end of a narrow trough of glass, filled with water, a lump of ice, and at the other end a bar of iron, heated by the flame of a spirit lamp. If a few drops of blue coloring liquid be introduced into the colder end of the vessel, and a like quantity of red-colored liquid similarly introduced into the other or warmth-receiving end, so as to render any movement of the water visible, it will be seen that a circuit is gradually produced. The colder and heavier water sinks to the bottom and spreads over it, the warmer and lighter water rises, and diffuses itself over the surface. A circuit or double current is thus formed, which lasts as long as the causes to which the difference of density is due are maintained in operation. Thus, on a small scale, is exactly what is maintained within the ocean bed of either hemisphere upon a large scale — the heated bar of metal representing the perennial warmth of tropical latitudes, and the lump of ice taking the place of the vast ice-fields and icebergs of polar waters. It is the intense cold by which the latter are occasioned that we must regard as, in the main, the originating cause of currents, though other influences, some of them of high importance, require to be taken into account. Among the latter, the influence exerted by the axial rotation of the globe takes the first place.

The axial rotation of the earth is an eastwardly motion. In virtue of it, everything on the surface of the globe is constantly moving to the eastward. The maximum rapidity of this motion is of course found under the equator, a circle which measures 25,000 miles, and the complete rotation of which within 24 hours is equivalent, in the case of any particular spot, to a rate of above 1,000 miles an hour. The actual rate of eastwardly motion becomes continually diminished with the diminishing magnitude of the successive parallels of latitude. Under the parallel of 60°, for example, a circle of only 12,000 miles, or half the measure of the equator, is carried round within the same period of 24 hours — giving to any particular spot on it a rate of only 500 miles per hour. At the pole itself axial motion vanishes. But persistence in motion is a well-known law of nature. Velocity of motion in any given direction is only gradually lost, as any increase in its amount is capable only of gradual acquisition. The maximum of eastwardly tendency proper to the waters of tropical seas is maintained, or but gradually lessened, in the course of their advance in the direction of the pole, and the result must be, in the case of the northern hemisphere, a northeastwardly direction; in the southern half of the globe, a southeastwardly direction. That is, the movement of tropical waters toward the pole, which, were the earth at rest, would be a movement, in the one hemisphere, from south to north, in the other from north to south, is deflected to the eastward of the meridian. In other words, the warm current which advances from the tropical belt in the direction of the pole only gradually loses its excess of eastwardly motion; hence, deflected to the eastward of the meridian, it becomes in the northern hemisphere a northeastwardly current, and as such is directed toward the western shores of Europe, and to the western shores of the New World within similar latitudes. In the southern hemisphere the like condition produces a southeastwardly current, instead of one flowing due south.

Under the operation of the same laws the streams that set out from polar latitudes in the direction of the equator, failing to acquire, or only gradually acquiring, the increasing rate of axial or eastwardly motion which belongs to the lower parallels toward which they are advancing, continually fall to the westward of the meridian. The actual direction of their movement is hence, in the northern hemisphere, to the westward of south — that is, the polar current becomes a southwesterly current, and meets the easterly shores of the continent toward which it is directed — the shores, namely,

of eastern Asia and the eastern side of the American continent. In the southern hemisphere the correspondent stream becomes a northwesterly instead of a northerly current. Proof that such is the actual direction of the great ocean streams is afforded by the fact of the productions of the torrid zone (tropical fruits, etc.) being continually thrown upon the coasts of western Europe, and by the vast icebergs — the produce of glaciers which overhang the waters of Baffin Bay and the Greenland Sea — carried toward the Atlantic coasts of the New World. The deep-sea currents of either ocean may thus, with great probability, be traced to an origin in polar or tropical waters respectively, and are to be classed under the head of cold or warm current accordingly. But the varying depths of the ocean-bed, and yet more the shapes of the land, materially modify, in many cases, the direction of their streams.

A distinction, however, must be drawn between deep-sea currents and surface or drift currents. It is probable that the latter owe their origin chiefly, if not wholly, to the action of the winds, which, within certain well-defined areas, are either perennial or seasonal. The belts of the Atlantic and Pacific over which the trade-winds blow are also those within which the westward-going or equatorial currents of those oceans are experienced. It is to the constant drift of surface-water to the westward, under the influence of the trade-wind, that the Equatorial Current of the Atlantic, and the similar Equatorial Current of the Pacific Ocean, are due. Within that portion of the Indian Ocean over which a perennial wind, correspondent in direction to the trade-winds of the Atlantic and Pacific, is experienced, that is, to the southward of the parallel of 5° or 6° south latitude, a like westward-setting current is found. In the northwardly half of the same basin — that is, within the monsoon-area of the Indian Ocean, and also within the like area of the China and adjacent seas — the currents undergo a like change of direction to the monsoons themselves.

The equatorial currents, with the counter-streams to which, under the influence of obstructions presented by the land, they give origin, are among the most important phenomena of the globe's surface. In the case of the Atlantic Ocean, the western limit of which is formed by a continuous mainland, unbroken through 110° of the meridian (from the entrance of Hudson Bay to the Strait of Magellan), or upward of 7,000 miles, the obstacle to further westwardly progress of the intra-tropical waters gives origin, there can be little doubt, to the Gulf Stream within its northwardly half, and to the Brazil current under its more southern parallels. The westward moving waters, encountering the eastward extension of the South American mainland, become of necessity divided into two streams, the one of which sets to the southward along the eastern coasts of Brazil, while the other advances along the more northwardly portions of the South American terra firma, past the outlets of the Amazons and the Orinoco, and thence into the Caribbean Sea. From the latter land-enclosed basin its course is necessarily into the similarly shut-in basin of the Mexican Gulf, whence it finally emerges through the narrow channel of Florida as the well-known Gulf Stream. The origin thus attributed to this famous current is in harmony with recognized laws relating to the movement of fluids acted on by a persistent force (such as the trade-winds supply), and under the influence of any opposing obstacle to farther advance in a given direction. In the case of the Pacific Ocean there exists no such complete obstruction to the westwardly progress of the equatorial waters, since the islands of the Malay Archipelago take the place which within correspondent parallels of the Atlantic is occupied by an unbroken line of coast. A portion of its equatorial stream, however, is deflected to the northward toward the coasts of Japan (where it forms the well-known Japan Stream, setting to the northeastward, past the Kuriles, in the direction of the Aleutian Islands), while another portion turns southwardly in the direction of Australia and New Zealand. In like manner, that portion of the Indian Ocean where alone a westwardly motion is constant — that is, the southern half of its basin — gives origin to a stream which, setting along the eastern shores of Madagascar and past the entrance of the Mozambique Channel, forms the initial portion of the Lagullas or Agulhas current. This latter sets in part round the headland whence its name is derived, carrying some of the waters of the Indian Ocean into the Atlantic; but a large portion of its waters (probably the larger), deflected by the extensive submarine elevation of the Agulhas Bank, returns into the Indian Ocean, forming part of a general eastwardly drift, within higher latitudes, in the direction of Australia.

Geographers were long led to entertain (and some still entertain) what seems to us a very exaggerated estimate of the results due to the one of them to which reference is most frequently made, namely, the "Gulf Stream." Recent observation and measurement have materially diminished this estimate. As a local current, however, the Gulf Stream is undoubtedly of high importance, and within certain limits it is one of the most powerful of currents. The initial portion of its stream has been already traced. From its issue through the Florida Channel the course of the Gulf Stream is to the north and eastward, in a direction parallel to the coast-line of the United States, past Cape Hatteras (lat. 35° 13′), and along the southern edge of the "great banks" of Nantucket and Newfoundland (between the meridians of 48° and 60° west of Greenwich), beyond which its existence as a distinct current cannot be traced, the farther course of its waters being absorbed in the general northeastwardly movement of the Atlantic, as described above.

Throughout the earlier portion of its course, and especially within its narrowest section, between the mainland of Florida and the little group of the Bemini Islands (lat. 25° 40′; lon. 75° 15′), the Gulf Stream constitutes a well-defined channel, the water of which is distinguished from that of the ocean upon either side, alike by its higher temperature and by its deep blue color. The difference of temperature is more marked by comparison with the coast-water — that is, the channel lying between the Gulf Stream itself and the shore line of the United States — than with the open sea to the eastward of its course; a consequence of the fact that a belt of cold water, derived from

the Polar or Baffin Bay current, and setting in the opposite direction to the Gulf Stream itself, flows side by side with the warmer current immediately along the mainland. The difference of temperature between the water of the Gulf Stream and that of the adjacent cold current on its inland side amounts at some seasons to 40 degrees (or even 30) F. This maximum difference of temperature, however, is perceptibly lessened after the current has passed the parallel of Cape Hatteras, and is gradually corrected in its farther course to the northeastward. The warm waters of the Gulf Stream and the cold waters of the Greenland or Baffin Bay current, interface off the "great bank" of Newfoundland, before reaching which the former has already so greatly diminished in depth as to have again become, what we regard it as having been in its origin, a mere surface-drift.

The velocity of the Gulf Stream is naturally greatest within the earlier and narrower portion of its course, that is, within the Strait of Florida, where it is equivalent to a mean of about 65 miles per day. This diminishes to 50 miles off Charleston, 36 to 46 miles off Nantucket, and 28 miles to the south of the Newfoundland Banks. The high temperature of its waters, even within its narrower and more strongly marked portion, is not maintained to the bottom of its channel, but is proved to give place at less than half its total depth to a much lower temperature. The observed temperature of the sea at the bottom of Florida Channel — that is, within the most powerful portion of the Gulf Stream — is only 34°, while the surface temperature varies between 80° and 84°! So greatly has popular belief, based upon scientific theories formed in the absence of observation, exaggerated the distinguishing conditions of this famous current. The Gulf Stream is undoubtedly of great importance as a local current, and plays its part in the general circuit of the North Atlantic waters. A general surface-drift to the eastward, in the direction of the African continent, is traceable between the parallels of 30° and 35°, its limits undergoing some variation with the seasons. This constitutes a return or counter movement to the westwardly drift of the equatorial Atlantic, and, combined with a southwardly set of the waters off the western coast of Africa, involves a general circuit of waters round a vast area of the North Atlantic Ocean, within which area are found the masses of floating weed known as the sargasso or gulf-weed. As to the supposed direct influence of the Gulf Stream upon the climate of western Europe, it may, we conceive, be safely dismissed as belonging to the realm of fancy. Indirectly, the warmth-giving influence of this famous current, such as it is, harmonizes with the more extended results due to the general set of the tropical waters in the direction of Europe. But the supposition that a narrow (and at the same time shallow) current, such as the Gulf Stream is proved, by direct observation, to be, can impart any appreciable warmth to the shores of western and northwestern Europe — nay, even (as the advocates of such a theory insist to be the case) to the waters that wash the shores of Nova Zembla and the Arctic coasts of Europe and Asia, and that after a course of one thousand of miles across an open expanse of ocean — seems to us quite at variance with probability, besides its inconsistency with known laws respecting the temperature of fluids in motion. The few degrees of superior heat that belong to the Gulf Stream after it has passed Cape Hatteras must be lost long before the mid-ocean is reached.

In the attempt to frame a theory which accounts satisfactorily for the existence and general movements of ocean currents, the many local conditions which affect particular parts of the sea can receive but the briefest reference. Tidal currents, due to the local ebb and flow as experienced in narrow seas, are of distinct origin. See OCEAN.

Cur'rie, Lady Mary Montgomerie Lamb Singleton ("VIOLET FANE"), English poet and miscellaneous writer. She was married in 1804 to Henry Sydenham Singleton, who died in 1893, and in 1894 to the 1st Baron Currie. Her books, published under the pseudonym of "Violet Fane," are: 'From Dawn to Noon' (1872); 'Denzil Place' (1875); 'The Queen of the Fairies' (1877); 'The Edwin and Angelina Papers' (1878); 'Collected Verses' (1880); 'Sophy, or the Adventures of a Savage' (1881); 'Thro' Love and War' (1886); 'Autumn Songs' (1889); 'The Story of Helen Davenant' (1889); 'Memoirs of Marguerite de Valois, Queen of Navarre' (1892); 'Under Cross and Crescent' (1900); 'Betwixt the Seas' (1899); 'Two Moods of a Man' (1901); 'Constance's Fate.'

Cur'rier, Charles Warren, American Roman Catholic clergyman: b. St. Thomas, West Indies, 22 March 1857. He studied in Holland chiefly philosophy and theology 1871–80; was ordained in 1880; lived in Surinam as a missionary 1881–2; and became pastor of St. Mary's, Washington, D. C., 1900. His published works are: 'Carmel in America' (1890); 'History of Religious Orders' (1894); 'Church and Saints' (1897); 'The Divinity of Christ' (1898); 'The Mass' (1899); and several historical romances.

Curry, Daniel, American Methodist clergyman: b. near Peekskill, N. Y., 20 Nov. 1809; d. New York 17 Aug. 1887. He was graduated at Wesleyan University in 1837, and after holding various pastorates and professorships, was chosen president of Indiana Asbury University in 1854. Ten years later he became editor of 'The Christian Advocate,' and in 1884 editor of the 'Quarterly Review.' He published 'Life of Wiclif' (1846); 'Platform Papers' (1880), etc.

Curry, Jabez Lamar Monroe, American educator and diplomat: b. Lincoln County, Ga., 5 June 1825; d. Asheville, N. C., 12 Feb. 1903. He was graduated at the University of Georgia in 1843 and at Harvard Law School in 1845. He became a Baptist minister, served in the Confederate army; was president of Howard College 1868–8; and in 1881 was appointed general agent of the Peabody Educational Fund and later also of the Slater Educational Funds. He was minister to Spain 1885–9, and special ambassador from the United States at the coronation of King Alfonso XIII. of Spain, 17 May 1902. He published: 'Constitutional Government in Spain' (1889); 'William Ewart Gladstone: a Study' (1891).

Curry, Samuel Silas, American educator: b. Chatata, Tenn., 1847. He was graduated at

Grant University 1872; has attained a wide reputation as a teacher of oratory and elocution, and has been connected in a teaching capacity with Boston University, Newton Theological Seminary, Harvard Divinity School, and the Yale Divinity School. He founded and is the head of a school of expression in Boston, Mass. His publications are: 'Province of Expression' (1891); 'Lessons in Vocal Expression' (1895); 'Imagination and Dramatic Instinct' (1896).

Cursores, kėr'sō-rēz, or **Runners,** an order of birds, which includes the ostrich, rhea, emu, cassowary, and apteryx. The birds of this order are distinguished by the rudimentary character of their wings, which are too short to be of use for flight, and by the length and strength of their legs. The breastbone is destitute of the ridge or keel which it possesses in most birds. The hind toe is wanting in all except the apteryx, in which it is rudimentary; the anterior toes are two or three in number. The barbs of the feathers are disconnected, and present a considerable resemblance to hairs. The order has been divided into the two families — *Struthionidæ* and *Apterygidæ,* the latter of which includes only the apteryx of New Zeland.

Curtin, Andrew Gregg, American politician: b. Bellefonte, Pa., 22 April 1815; d. there 7 Oct. 1894. He studied law at Dickinson College, and was admitted to the bar in 1839. Entering politics, he became secretary of the commonwealth of Pennsylvania in 1854, governor in 1860, and again in 1863, being one of the most noted "war governors" of the Civil War period. In 1869 he was appointed minister to Russia. In 1873 he left the Republican party, and from 1881 to 1887 sat in Congress as a Democrat.

Curtin, Jeremiah, American linguist and antiquarian: b. Milwaukee, Wis., 1838. He has written: 'Myths and Folklore of Ireland'; 'Tales of the Fairies and the Ghost World'; 'Myths and Folk-Tales of the Russians, Western Slavs, and Magyars'; 'Hero Tales of Ireland'; etc. He has translated much from Russian and Polish, and is widely known by his translations from the latter language of the novels of Sienkiewicz.

Curtis, Alfred A., American Roman Catholic prelate: b. Somerset county, Md., 4 July 1831. When only 21 years old he was ordained in the Episcopal ministry and for several years labored on Eastern Shore and later in Baltimore, and Western Maryland, finally returning to Baltimore. Later he resigned his ministerial duties, entered the Catholic Church, took a theological course of two and a half years, was ordained priest by Archbishop Bayley, 17 Dec. 1874 and stationed at Baltimore Cathedral till 14 Nov. 1886, when he was consecrated Bishop of Wilmington, Delaware.

Curtis, Benjamin Robbins, American jurist: b. Watertown, Mass., 4 Nov. 1809; d. Newport, R. I., 15 Sept. 1874. He was graduated at Harvard 1829; was admitted to the bar 1832, and rose rapidly to the height of his profession in Boston, Mass. He was appointed to the United States Supreme Court 1851, and in the famous Dred Scott case made a powerful argument dissenting from the court's decision. Resigning in 1857 he was a member of the State legislature for two years; and in 1868 one of the counsel for the defense in the impeachment trial of Andrew Johnson. His writings include: 'Reports of Cases in the Circuit Courts of the United States' (1854); 'Decisions of the Supreme Court of the United States, with notes and a digest'; 'Jurisdiction, Practice, and Peculiar Jurisdiction of the Courts of the United States' (1880). Consult 'Memoir and Writings' (1880).

Curtis, Edward, American medical scientist: b. Providence, R. I., 4 June 1838. He is a brother of G. W. Curtis (q.v.). He was graduated at Harvard in 1859, and took his medical degree at the University of Pennsylvania in 1864. He was an army surgeon during the Civil War and since 1866 has been a member of the faculty of the College of Physicians and Surgeons in New York. He has made a specialty of microscopic study and the camera in connection with diagnosis, and has published a 'Manual of General Medicinal Technology' (1883).

Curtis, George Ticknor, American lawyer: b. Watertown, Mass., 28 Nov. 1812; d. New York 28 March 1894. He was a brother of B. R. Curtis (q.v.). In addition to his eminence at the New York bar he was noted as the author of an authoritative 'History of the Constitution of the United States.' He published likewise: 'Digest of English and American Admiralty Decisions'; 'American Conveyancer'; 'Life of James Buchanan'; 'Life of Daniel Webster'; 'Creation or Evolution'; and 'John Charaxes,' a novel.

Curtis, George William, American essayist and journalist: b. Providence, R. I., 24 Feb. 1824; d. New Brighton, Staten Island, N. Y., 31 Aug. 1892. At 18 he spent some months at Brook Farm (q.v.) and a few years later visited the Old World, the results of his travels appearing in 'Nile Notes of a Howadji' (1851); and 'The Howadji in Syria' (1852). He was an early sympathizer with the abolition movement and as the editor of 'Harper's Weekly' for nearly a generation, exercised a measurable influence over the more thoughtful of his countrymen. At an earlier period he was editor of 'Putnam's Magazine,' which did not prove a financial success, and for many years thereafter he devoted the proceeds of his lecture tours to paying off the obligations incurred in relation to that enterprise. From 1854, till not long before his death, he edited the "Easy Chair" department of 'Harper's Magazine,' and it is by his "Easy Chair" essays that he is likely to be longest remembered. In these are displayed a gentle persuasiveness of argument, and a fund of humor which made them very attractive reading, while the style was at all times polished and graceful. In them he touched upon the varied topics of the day, the lighter as well as the more serious, and since his death several small volumes of selections from them have been published. He was one of the leaders of the Republican party at its outset and in his later years was conspicuous as an advocate of civil service reform and of independent action in politics. As a lecturer and orator he was

very popular, and several of his political speeches and orations upon special occasions take high rank among specimens of American oratory. Beside the volumes already named he published: 'Lotus Eating' (1852); 'The Potiphar Papers' (1853); 'Prue and I' (1856); 'Trumps' (1862). These are more or less ephemeral in their nature, 'Prue and I' being the only work among them which interests the present generation. His 'Orations and Addresses,' edited by C. E. Norton, appeared (1893–4). Consult Cary, 'George William Curtis' (1894).

Curtis, Mattoon Monroe, American educator: b. Rome, N. Y., 19 Oct. 1858. He was graduated at Hamilton College, N. Y., 1880, and from the Union Theological Seminary 1883. He was pastor of a Presbyterian church at Cleveland, Ohio, 1885–8, and in 1891 was elected Handy professor of philosophy in the Western Reserve University. He has published: 'Locke's Ethics'; 'Philosophy and Physical Science'; 'Philosophy in America': etc.

Curtis, Samuel Ryan, American soldier: b. near Champlain, N. Y., 3 Feb. 1807; d. Council Bluffs, Iowa, 26 Dec. 1866. He was graduated at West Point 1831; served as colonel in the Mexican war, and was a Republican congressman from his State 1857–61. He was commissioned a brigadier-general 17 May 1861; defeated Gens. Price and McCulloch in a decisive engagement at Pea Ridge, Ark., and was promoted major-general 21 March 1862.

Curtis, William Eleroy, American journalist: b. Akron, Ohio, 5 Nov. 1850. He has written: 'Children of the Sun' (1882); 'Capitals of Spanish America' (1888); 'The Land of the Nihilist' (1888); 'Japan Sketches'; 'Venezuela' (1891); 'Life of Zachariah Chandler'; 'The Yankees of the East' (1896); 'To-day in France and Germany' (1897); 'Between the Andes and the Ocean' (1900); etc. He was director of the Bureau of American Republics 1890–3, and chief of the Latin-American department and historical section of the World's Columbian Exposition 1891–3.

Curtiss, Samuel Ives, American Congregational clergyman: b. Union, Conn., 5 Feb. 1844; d. London, Eng., 22 Sept. 1904. He was graduated at Amherst College 1867, and the Union Theological Seminary 1870; and was pastor of the American chapel in Leipsic 1874–8. In 1878 he was appointed professor of biblical literature in Chicago Theological Seminary, but changed later to the chair of Old Testament literature and interpretation. His publications include: A translation of Bickell's 'Outlines of Hebrew Grammar' (1877); 'The Levitical Priests' (1877); translations of Delitzsch's 'Old Testament History of Redemption' (1881); 'Franz Delitzsch' (1890); 'Ezekiel and His Times' (in 'The Bible as Literature' 1896); etc.

Curtius, koor'tsē-oos, **Ernst,** German Hellenist: b. Lübeck 2 Sept. 1814; d. Berlin 12 July 1896. He was educated at Göttingen, Bonn, and Berlin, and in 1856 succeeded Hermann as professor at Göttingen, and in 1868 was called to Berlin University. He made several journeys to places of archæological interest in Greece and Asia Minor. Of his works, which mostly relate to Greek antiquities, the best known is his 'History of Greece' (1857–61), translated into English by A. W. Ward (1868–73). Other works by him are: 'De Portubus Athenarum' (1842); 'Klassische Studien' (1849); 'Inscriptiones Atticæ XII.' (1848); 'Olympia' (1852); 'Die Ionier' (1855); 'Peloponnesos' (1851–2).

Curtius, Georg, gā'ōrg, German philologist: b. Lübeck 16 April 1820; d. Hermsdorf 12 Aug. 1885. He was a brother of Ernst Curtius (q.v.), and in 1849 went to Prague as professor of classical philology, removing five years later to the corresponding chair at Kiel. In 1861 he became professor in Leipsic University, and held this post till his death. His earliest work was 'De Nominum Græcorum Formatione' (1842); and among many important later ones are: 'Grundzüge der Griechischen Etymologie' (1858–62), his *chef d'œuvre* translated into English by Wilkins and England; 'Zur Chronologie der Indogermanischen Sprachforschung' (1867); 'Das Verbum der Griechischen Sprache' (1873 and 1876); and 'Griechische Schulgrammatik' (1852), the last two having been translated for English students.

Curtius, kėr'shĭ-ŭs, **Marcus,** Roman legendary hero, who, according to tradition, sacrificed himself for the good of his country. In 362 B.C. it is said a chasm opened in the Roman forum, from which issued pestilential vapors. The oracle declared that the chasm would close whenever that which constituted the glory of Rome should be thrown into it. Curtius asked if anything in Rome was more precious than arms and valor; and being answered in the negative, arrayed himself in armor, mounted a horse splendidly equipped, solemnly devoted himself to death in presence of the Roman people, and sprang into the abyss, which instantly closed over him. The lacus Curtius, which marked the spot, has been discovered by the modern archæologist.

Curtius, Rufus Quintus, Roman historian. He wrote the history of Alexander the Great in 10 books, the first two of which are lost. The exact period in which he flourished is not known; for though his style would indicate that he lived in one of the best periods of the Latin language, no writer of any earlier date than the 12th century has made any mention of his work.

Curtius, Theodor, tā'ō-dōr koor'tsē-oos, German chemist: b. Duisberg 27 May 1857. He studied at Leipsic, Heidelberg, and Munich; in 1886 was lecturer at the University of Erlangen; in 1889 became professor of chemistry at Kiel, and in 1897 at the University of Heidelberg. He investigated the diazo- compounds of the fats, and discovered hydrazine and hydrazoic acid, both compounds of nitrogen.

Curule Magistrates were the highest dignitaries of the Roman state, and distinguished from all others by enjoying the privilege of sitting on ivory chairs (*sellæ curules*) when engaged in their public functions. The curule magistrates were the consuls, prætors, censors, and chief ædiles, who, to distinguish them from the plebeian ædiles, were called curule.

Curves of Double Curvature. (In French, *courbes gauches;* in German, *Curven doppelter Krummung.*) A curve whose points do not all lie in a plane is variously called space curve, twisted curve, tortuous curve, or curve of double curvature. The significance of the last-named designation becomes apparent in the description of the elements which enter the theory of the curve.

There are two ways of regarding the curve: first, as given immediately and in all its extent by the intersection of two surfaces—a purely geometric conception; second, as arising kinematically through the continuous movement of a point. The first conception leads to the analytical formulation of a curve as the locus of points whose Cartesian coördinates satisfy two equations, the equations of the intersecting surfaces

$$(1) \qquad f_1(x, y, z) = 0, \quad f_2(x, y, z) = 0.$$

The second conception leads to the expression of the Cartesian coördinates x, y, z as functions of a variable magnitude u called the parameter:

$$(2) \qquad x = \phi(u), \quad y = \chi(u), \quad z = \psi(u),$$

a form of representation called the parametric representation of the curve. To the continuous succession of values of u corresponds the continuous succession of points of the curve.

It is known that not every curve in space is the complete intersection of two surfaces, and therefore (1) and (2) are not always equivalent forms. In fact, when the three equations (2), defining a curve, are transformed to the two equations (1), the latter often furnish curve branches in addition to the original curve. The parametric representation is, in many important respects, preferable to the first form, and such equations and formulas as are hereafter used will have reference to this form.

The subject-matter may be conveniently divided into four parts: first, the determining elements of an infinitely small portion of the curve in the neighborhood of any point P of the curve; second, the character of the curve as a whole, and the associated curves and surfaces; third, special curves and their derivation from given properties; fourth, classification, miscellaneous points, and the literature of the subject.

1. *The Elements of the Curve at a Point.*—The consideration of two points, of three points, and of four points of the curve conducts immediately to fundamental elements.

The *tangent* at P is the limiting position assumed by the right line through P and a neighboring point P_1 of the curve as P_1 moves along the curve toward coincidence with P. It is convenient to say that the tangent at P is the right line through P and P_1, P_1 being infinitely near or consecutive to P.

The single infinity of lines through P perpendicular to the tangent are *normals* to the curve and define the *normal plane* of the curve at P. Every plane through the tangent is a tangent plane at P. A plane passing through P and two neighboring points of the curve assumes in general a limiting position at P as the two neighboring points move along the curve toward coincidence with P. This is the *plane of osculation* at P and may be described as the plane determined by three consecutive points P, P_1, P_2. It is the tangent plane at P which has the closest contact with the curve.

The plane through the tangent perpendicular to the plane of osculation is called the *plane of rectification* at P. The normal plane, the plane of osculation, and the plane of rectification are mutually at right angles and constitute the principal planes of the curve at P. Their intersections are three lines through P: the *tangent*, which is the intersection of the plane of osculation and the plane of rectification; the *principal normal*, which is the intersection of the normal plane and the plane of osculation; the *binormal*, the intersection of the normal plane and the plane of rectification. The three lines form a configuration called the *principal triedral* at P.

Of importance in the theory is the *circle of curvature*, namely, the limit circle defined by the fixed point P and two variable points P_1, P_2 as the variable points move along the curve toward coincidence with P. It is referred to as the circle through three consecutive points P, P_1, P_2 and obviously lies in the plane of osculation at P. Its center, radius, and the reciprocal of the radius are called respectively the *center of curvature*, the *radius of curvature*, and the *curvature of the curve* at P. Relative to the name, curve of double curvature, the curvature here described is properly first curvature, but it is customary to omit the word 'first'. The second curvature, to be noted shortly, is usually referred to as *torsion*.

Four points not in a plane determine one sphere. Through P and three variable points of the curve a sphere may be passed, which, when the variable points come into coincidence with P, becomes the *sphere of osculation* at P. It will be subsequently seen that its center and the center of first curvature are on a line parallel to the binormal at P.

The further development of the theory will employ the methods of the differential geometry in preference to limit processes. The elements already defined, when taken in pairs, give rise to new elements. The normal planes at the consecutive points P and P_1 intersect in a line passing through the center of curvature of P and parallel to the binormal of P. It is called the *axis of curvature* of the curve at P. The planes of rectification at P, P_1 intersect in the *line of rectification* at P. This line passes through P, makes an angle with the binormal of P, and is perpendicular to the principal normals of P and P_1. The planes of osculation at P, P_1 intersect in the tangent of the curve. The principal normals at P and P_1 do not intersect, nor do the binormals of P and P_1. The consecutive tangents do intersect in a point of the curve.

The Two Curvatures, or Curvature and Torsion.—As a point moves on the curve, the tangent continually changes its direction, as does also the plane of osculation: the first marks the tendency of the curve to depart from a right line, and the second the tendency to depart from a plane. Measures of these tendencies at a point P are defined as follows: If PP_1 be an infinitely small arc of length ds, and $d\varepsilon$ the infinitely small angle between the tangents at P and P_1; and $d\tau$ the infinitely small angle between the planes of osculation at P and P_1, or, what is the same thing, the angle between the binormals of P and P_1: then the ratio $\frac{d\varepsilon}{ds}$ is called the *curvature of the curve at P*, and the ratio $\frac{d\tau}{ds}$ is called the *torsion of the curve at P*. The angles $d\varepsilon$ and $d\tau$ are called respectively *angle of contingence*, and *angle of torsion*, at P. This point of view of curvature leads at once to the circle of curvature previously described. The

ratio $\frac{d\epsilon}{ds}$ has the same value for the curve and the circle at P, and if K designates the radius of the circle, there results *curvature at a point* $\frac{1}{K}=\frac{d\epsilon}{ds}$. On the other hand, there is no circle of torsion connected with the curve, and it is only by analogy that the term *radius of torsion*, T, is defined to be the reciprocal of the torsion. Expressed in equational form, *torsion at a point* $=\frac{1}{T}=\frac{d\tau}{ds}$.

A third curvature is sometimes regarded, but merely as a convenience. It is the ratio of the infinitely small angle $d\kappa$ between the principal normals at P and P_1 to the arc ds. It is in a sense the resultant of the other two curvatures, and has received the name of *entire curvature*. The angle $d\kappa$ is called the *angle of entire curvature*. Entire curvature is not an independent curvature, for, as will shortly be seen, its angle $d\kappa$ is a function of the other two through the equation $d\kappa^2=d\epsilon^2+d\tau^2$.

Before clothing the foregoing definitions in analytical garb, it is necessary to adopt conventions as to the signs of directions, and to complete the notation. Of the two directions on a curve, that is taken as positive which corresponds to increasing values of u. The positive direction of the tangent is taken to coincide with the positive direction of the curve, and the direction cosines of the angles the positive tangent makes with the positive directions of the coordinate axes x, y, z are designated by $\alpha_1, \beta_1, \gamma_1$, respectively. The positive direction of the principal normal is the direction from P toward the center of curvature, and its direction cosines are designated by α_2, β_2, γ_2. The positive direction of the binormal is so taken that it is directed with respect to the positive tangent and positive principal normal as the positive z axis is directed to the positive x axis and positive y axis. Its direction cosines are represented by α_3, β_3, γ_3.

A table conveniently exhibits these relations:

	x	y	z
Tangent	α_1	β_1	γ_1
Principal normal	α_2	β_2	γ_2
Binormal	α_3	β_3	γ_3

In the elements of solid analytic geometry, it is shown that the determinant of the nine direction cosines equals 1, *i.e.*, $\begin{vmatrix}\alpha_1 & \beta_1 & \gamma_1\\ \alpha_2 & \beta_2 & \gamma_2\\ \alpha_3 & \beta_3 & \gamma_3\end{vmatrix}=1$, and that each constituent is equal to its cofactor. For example, $\alpha_2=\gamma_1\beta_3-\gamma_3\beta_1$. It is also a theorem of the elements of analytic geometry of space, that if a straight line varies its direction infinitely little, say by an angle $d\omega$, and if l, m, n are the direction cosines of the first position, and $l+dl$, $m+dm$, $n+dn$ are the direction cosines of the second position, that $d\omega^2=dl^2+dm^2+dn^2$. It has immediate application in the two curvatures.

Taking over from the calculus the value of ds^2 and differentiating,

$$(3)\qquad \begin{aligned} ds^2&=dx^2+dy^2+dz^2,\\ ds\,d^2s&=dx\,d^2x+dy\,d^2y+dz\,d^2z.\end{aligned}$$

The analytical side of the foregoing development is now easily formulated. All equations which follow and which contain the variables x, y, z and their differentials dx, dy, dz, d^2x, d^2y, d^2z, ds, d^2s may be expressed in terms of the parameter u and its differential du by means of equations (2), the equations resulting from their differentiation, and equations (3).

One has immediately from the definitions of the elements at the point $P(x, y, z, u)$

$$(4)\qquad \alpha_1=\frac{dx}{ds},\quad \beta_1=\frac{dy}{ds},\quad \gamma_1=\frac{dz}{ds};$$

hence, for the equations of the tangent,

$$(5)\qquad \frac{\xi-x}{dx}=\frac{\eta-y}{dy}=\frac{\zeta-z}{dz},$$

and for the normal plane,

$$(6)\qquad (\xi-x)dx+(\eta-y)dy+(\zeta-z)dz=0.$$

The symbols ξ, η, ζ represent here and subsequently the current coordinates of the points of line, plane, etc.

In determining the constants L, M, N, Q so that the plane $L\xi+M\eta+N\zeta+Q=0$ passes through the point x, y, z, and the infinitely near points $x+dx$, $y+dy$, $z+dz$, and $x+2dx+d^2x$, $y+2dy+d^2y$, $z+2dz+d^2z$, one obtains

$$\begin{aligned}(\xi-x)(dy\,d^2z-dz\,d^2y)+(\eta-y)(dz\,d^2x-dx\,d^2z)\\ +(\zeta-z)(dx\,d^2y-dy\,d^2x)=0,\end{aligned}$$

or, in putting for convenience

$$(7)\qquad \begin{aligned} A&=dy\,d^2z-dz\,d^2y,\quad B=dz\,d^2x-dx\,d^2z,\\ C&=dx\,d^2y-dy\,d^2x,\end{aligned}$$

the equation of the plane of osculation in the form

$$(8)\qquad A(\xi-x)+B(\eta-y)+C(\zeta-z)=0.$$

This at once gives

$$(9)\qquad \alpha_3=\frac{A}{\sqrt{A^2+B^2+C^2}},\quad \beta_3=\frac{B}{\sqrt{A^2+B^2+C^2}},$$
$$\gamma_3=\frac{C}{\sqrt{A^2+B^2+C^2}};$$

and for the equations of the binormal

$$(10)\qquad \frac{\xi-x}{A}=\frac{\eta-y}{B}=\frac{\zeta-z}{C}.$$

From the determinant of the direction cosines one has

$$(11')\qquad \begin{aligned}\alpha_2&=\gamma_1\beta_3-\gamma_3\beta_1,\quad \beta_2=\alpha_1\gamma_3-\alpha_3\gamma_1,\\ \gamma_2&=\beta_1\alpha_3-\beta_3\alpha_1,\end{aligned}$$

and hence, by virtue of (4) and (9),

$$(11)\qquad \alpha_2=\frac{Bdz-Cdy}{ds\sqrt{A^2+B^2+C^2}},\quad \beta_2=\frac{Cdx-Adz}{ds\sqrt{A^2+B^2+C^2}},$$
$$\gamma_2=\frac{Ady-Bdx}{ds\sqrt{A^2+B^2+C^2}}.$$

The equation of the plane of rectification is

$$(12)\qquad (\xi-x)\alpha_2+(\eta-y)\beta_2+(\zeta-z)\gamma_2=0,$$

and the equations of the principal normal are

$$(13)\qquad \frac{\xi-x}{\alpha_2}=\frac{\eta-y}{\beta_2}=\frac{\zeta-z}{\gamma_2}.$$

Applying to curvature the theorem relative to the infinitely small change in direction of a right line, one has $d\varepsilon^2=d\alpha_1^2+d\beta_1^2+d\gamma_1^2$, whence, in differentiating (4) and employing (3) in the reduction,

$$(14)\qquad (\text{curvature})^2=\frac{1}{R^2}=\frac{d\varepsilon^2}{ds^2}=\frac{A^2+B^2+C^2}{ds^6},$$

and also

$$(15)\qquad d\alpha_1=\frac{Bdz-Cdy}{ds^3},\quad d\beta_1=\frac{Cdx-Adz}{ds^3},$$

$$d\gamma_1=\frac{Ady-Bdx}{ds^3}.$$

A comparison of (11), (14), and (15) gives

$$(16)\qquad \alpha_2=R\frac{d\alpha_1}{ds},\quad \beta_2=R\frac{d\beta_1}{ds},\quad \gamma_2=R\frac{d\gamma_1}{ds}.$$

When the arc s is the independent variable, that is, when $u=s$, equations (14) and (16) take simple forms,

$$\frac{1}{R^2}=\frac{d^2x}{ds^2}+\frac{d^2y}{ds^2}+\frac{d^2z}{ds^2};$$

$$\alpha_2=R\frac{d^2x}{ds^2},\quad \beta_2=R\frac{d^2y}{ds^2},\quad \gamma_2=R\frac{d^2z}{ds^2}.$$

Applying the same process to torsion, $d\tau^2=d\alpha_3^2+d\beta_3^2+d\gamma_3^2$, and a differentiation of (9) gives

$$(17)\qquad d\alpha_3=-\frac{Bdz-Cdy}{\sqrt{A^2+B^2+C^2}}\,\frac{Ad^3x+Bd^3y+Cd^3z}{A^2+B^2+C^2},$$

$$d\beta_3=-\frac{Cdx-Adz}{\sqrt{A^2+B^2+C^2}}\,\frac{Ad^3x+Bd^3y+Cd^3z}{A^2+B^2+C^2},$$

$$d\gamma_3=-\frac{Ady-Bdx}{\sqrt{A^2+B^2+C^2}}\,\frac{Ad^3x+Bd^3y+Cd^3z}{A^2+B^2+C^2},$$

whence

$$(18)\qquad \text{torsion}=\frac{1}{T}=\frac{d\tau}{ds}=-\frac{Ad^3x+Bd^3y+Cd^3z}{A^2+B^2+C^2}.$$

The radical $\sqrt{A^2+B^2+C^2}$ is to be taken throughout with positive sign. The numerator in the value of torsion, written in the form of a determinant, is $\begin{vmatrix} dx & dy & dz \\ d^2x & d^2y & d^2z \\ d^3x & d^3y & d^3z \end{vmatrix}$, and its evanishment for all values of u is the necessary and sufficient condition that the space curve is in reality a plane curve. If it vanishes only for isolated values of u, the planes of osculation at the corresponding points are *stationary*, that is the plane of osculation does not tend to change in passing to the consecutive point. Curvature and therefore R are always taken positive. This, however, is not the case with torsion; its sign may be positive or negative and is determined without ambiguity in the foregoing equation. A space curve is said to have a right (left) twist at P if it appears to an observer, standing at P on the plane of osculation (either side) and looking in the direction of the center of curvature, to rise from left (right) to right (left) through P. The above formula, with this definition of twist, associates right twist with positive torsion and left twist with negative torsion.

The Frenet Equations.—These are nine very important equations in which the quotients of the differentials of the direction cosines of the lines of the principal triedral divided by ds, are expressed in terms of the direction cosines and R and T. Six of these equations are already at hand: from (16)

$$(19)\qquad \frac{d\alpha_1}{ds}=\frac{\alpha_2}{R},\quad \frac{d\beta_1}{ds}=\frac{\beta_2}{R},\quad \frac{d\gamma_1}{ds}=\frac{\gamma_2}{R};$$

from (11), (17), and (18)

$$(20)\qquad \frac{d\alpha_3}{ds}=\frac{\alpha_2}{T},\quad \frac{d\beta_3}{ds}=\frac{\beta_2}{T},\quad \frac{d\gamma_3}{ds}=\frac{\gamma_2}{T};$$

from (11′) by differentiation, with substitutions from (19) and (20),

$$(21)\qquad \frac{d\alpha_2}{ds}=-\frac{\alpha_1}{R}-\frac{\alpha_3}{T},\quad \frac{d\beta_2}{ds}=-\frac{\beta_1}{R}-\frac{\beta_3}{T},$$

$$\frac{d\gamma_2}{ds}=-\frac{\gamma_1}{R}-\frac{\gamma_3}{T}.$$

The equations were also given later by Serret and are sometimes called by his name. They are particularly used in the differentiation of equations, and are of importance in questions relating to the determination of curves with assigned properties.

2. *The Curve and its Associated Curves and Surfaces.*—There are four ruled surfaces on which the space curve lies and a fifth ruled surface on which it does not lie, to all of which surfaces it sustains special relations. The tangents at all the points of the curve constitute the *tangential surface* of the curve. This surface consists of two sheets with the space curve as a sharp edge. A normal plane at P intersects the two sheets of the surface in a curve which has P as a cusp point. The space curve is the locus of intersections of consecutive tangents and is called the *edge of regression* of the tangential surface. The surface is a developable surface,[1] namely, one which could be supposed laid down in a plane without stretching. To the space curve there is an infinity of involutes all lying in the tangential surface. One may imagine a string stretched on the curve and so unwound that the part continually being freed from the curve remains tangent to the curve; each point of the string will describe an involute on the tangential surface to which the space curve is an evolute.

The locus of the binormals of the curve is called the *surface of the binormals*. It is a non-

developable or skew surface.[1] The infinitely small arc element is perpendicular to the binormals at its extremities, whence it follows that the space curve is the *line of striction*[1] of its binormal surface.

The locus of the principal normals is a skew surface and is called the *surface of the principal normals*. The space curve is an orthogonal trajectory of the right lines of the surface and is also an asymptotic[1] line of the surface. This latter property follows from the fact that the planes of osculation of the curve are tangent planes to the surface at the points of the curve.

The locus of the lines of rectification is a developable surface and is called the *surface of rectification* of the curve. It owes its name to the circumstance that when it is developed in a plane, the space curve is transformed into a straight line. From this it follows that a space curve is a geodesic[1] on its surface of rectification. That the space curve passes into a straight line when the surface of rectification is developed in a plane, is readily established from the Frenet equations (21). The angle between two consecutive planes of rectification, $d\kappa$, vanishes in the development of the surface, or $d\kappa^2 = d\alpha_2^2 + d\beta_2^2 + d\gamma_2^2 = 0$. Writing (21) in the form $d\alpha_2 = -\alpha_3 ds = a_3 d\tau$, $d\beta_2 = \ldots$, $d\gamma_2 = \ldots$, squaring and adding, there results $ds^2 + d\tau^2 = 0$, or $ds = 0$, $d\tau = 0$. As the angle of contingence is zero, the consecutive tangents of the developed curve coincide, and the curve is a straight line.

The fifth ruled surface is the locus of the axes of curvature. It is a developable surface, not containing the curve, but containing the curve of centers of curvature and also the curve of centers of the osculating spheres. The surface bears the name of *polar surface*, or *evolute surface*. The axis of curvature is sometimes called polar axis and hence the name polar surface. To the space curve as an involute there is an infinity of evolute curves all lying on the polar surface, and hence the name evolute surface. If one imagined a string stretched freely on the polar surface with one extremity at P of the space curve, the part of the string on the surface would lie in one of the evolutes of the space curve. Further, if two strings were supposed joined at P, each lying on an evolute, and the two strings then unwound from the polar surface, the point P would describe the space curve, and the angle between the strings at P would remain constant in the motion. The polar surface is the common surface of rectification of all the evolutes, and these curves are, accordingly, geodesics of the surface.

The curve of centers of curvature is the intersection of the polar surface and the principal normal surface. Its equations are

$$(22) \qquad \xi = x + R\alpha_2, \quad \eta = y + R\beta_2, \quad \zeta = z + R\gamma_2.$$

Those of the axis of curvature are

$$\xi = x + R\alpha_2 + v\alpha_3, \quad \eta = y + R\beta_2 + v\beta_3,$$
$$\zeta = z + R\gamma_2 + v\gamma_3$$

for u constant and v variable. If u is regarded as variable as well as v, the equations define the polar surface. Two consecutive axes of curvature, say the axes of P and P_1, intersect in a point of the edge of regression of the surface, but the point as a point on the first axis is equidistant from P, P_1, P_2, and as lying on the second axis is equidistant from P_1, P_2, P_3, and is therefore equidistant from P, P_1, P_2, P_3 or is the center of the osculating sphere at P. The edge of regression of the polar surface is the locus of the centers of the osculating spheres of the space curve. Analytically treated the problem gives for the equations of the locus of centers of the osculating spheres

$$(23) \qquad \xi = x + R\alpha_2 - \frac{dR}{d\tau}\alpha_3, \quad \eta = y + R\beta_2 - \frac{dR}{d\tau}\beta_3,$$

$$\zeta = z + R\gamma_2 - \frac{dR}{d\tau}\gamma_3,$$

and for the radius, r, of the sphere

$$(24) \qquad r^2 = R^2 + \left(\frac{dR}{d\tau}\right)^2.$$

There is a complete reciprocity between a space curve and the edge of regression of its polar surface when, and only when, the space curve is a curve of constant curvature, i.e., R = constant. Equations (23) reduce to (22), showing that the curve on the polar surface becomes the locus of the centers of curvature of the space curve. Some of the relations between the two curves when R = constant are here stated: Each is the locus of the centers of curvature of the other with the same constant curvature; the tangent of the one is the axis of curvature of the other; the corresponding plane of osculation of the one is the normal plane of the other; corresponding planes of rectification are parallel, angle of contingence of the one equals angle of torsion of the other. The last two properties hold also when R is not constant.

If a space curve is spherical, its polar surface will be a cone with vertex at the center of the sphere, and the polar edge of regression reduces to a point, the center of the sphere. ξ, η, ζ are, accordingly, constants for all values of u, and their differentials are zero. The differentiation furnishes $Rd\tau + d\left(\frac{dR}{d\tau}\right) = 0$ as the necessary and sufficient condition for a spherical curve.

Spherical Depiction.—Each point of the space curve is coördinated with a point on the surface of a unit sphere in a definite manner. Assume a sphere of radius one with center at the origin of axes, and draw a radius to a point p of the surface parallel to the positive direction of the tangent at the point P of the curve. The point p is the spherical image or picture of P with respect to the tangent, and the picture of all the points of the space curve is a curve called the *spherical indicatrix of the space curve with respect to the tangent*. Similarly, there are spherical images with respect to the principal normal, binormal, etc. Such depictions lead to problems concerning the determination of curves with given spherical images.

Intrinsic Equations.—A space curve is completely determined as to its form, though not as to its position in space, when curvature and torsion are given in terms of the arc s of the curve. Two equations of this character are called the intrinsic equations of the curve. To pass from the intrinsic equations $R = f(s)$,

$T=g(s)$ to the parameter representation requires the integration of a differential equation of the Riccati form. A discussion of the problem is given in Darboux, Vol. I, and in Scheffer, Vol. I (see paragraph on literature of subject). Curvature and torsion do not change in value when the curve is moved about in space, nor do the successive derivatives of curvature and torsion with respect to s change in value. These quantities and all functions of them are called differential invariants with respect to all movements of the curve in space.

3. *Special Curves.*—The curve of constant curvature. $\frac{1}{R}=$constant, has already been spoken of. It is obvious that in the development of the tangential surface in a plane, the curve transforms into a circle. Any curve of this class of radius of curvature R is given by the equations

$$x=R\int\lambda d\theta,\quad y=R\int\mu d\theta,\quad z=R\int\nu d\theta,$$

in which λ, μ, ν are any three functions of θ that satisfy the two equations,

$$(25)\quad \lambda^2+\mu^2+\nu^2=1,\quad \left(\frac{d\lambda}{d\theta}\right)^2+\left(\frac{d\mu}{d\theta}\right)^2+\left(\frac{d\nu}{d\theta}\right)^2=1.$$

Direct differentiation of the equations of the curve will show that $\lambda=\alpha_1$, $\mu=\beta_1$, $\nu=\gamma_1$, and $d\theta=d\varepsilon$.

The curve of constant torsion $\frac{1}{T}=$ constant is defined by the equations

$$x=T\int\left(\mu\frac{d\nu}{d\theta}-\nu\frac{d\mu}{d\theta}\right)d\theta,\quad y=T\int\left(\nu\frac{d\lambda}{d\theta}-\lambda\frac{d\nu}{d\theta}\right)d\theta,$$

$$z=T\int\left(\lambda\frac{d\mu}{d\theta}-\mu\frac{d\lambda}{d\theta}\right)d\theta,$$

where λ, μ, ν are functions of θ satisfying the conditions (25). Again, direct differentiation of the equations shows $\lambda=\alpha_3$, $\mu=\beta_3$, $\nu=\gamma_3$, and $d\theta=d\tau$. Examples of curves of constant torsion are furnished by the asymptotic curves of surfaces of constant negative (Gauss) curvature.[1] This theorem was established by Enneper, 'Göttinger Nachrichten,' 1870.

The curves in which the ratio of curvature and torsion is constant, $\frac{T}{R}=$constant, is a helix, namely, a curve on a cylindrical surface that intersects all the right-line generators of the surface under a constant angle. This curve is a general helix. When, however, both curvature and torsion are constant, the curve becomes the ordinary helix, *i.e.*, the helix on a right circular cylinder. A helix passes into a straight line when the cylindrical surface is developed in a plane. The cylindrical surface is its surface of rectification, and the right-line generators are the lines of rectification. The helix is, accordingly, a geodesic of the cylindrical surface, and this property itself could be taken as the definition of a helix. The principal normals are all parallel to a plane perpendicular to the generators of the cylindrical surface. The original sources on the subject of the helix are Puiseux, 'Journ. de Math.,' 7 (1842); Bertrand, 'Journ. de Math.' 13 (1848).

Bertrand found that if a curve is of such a character that there exists between its curvature and torsion a linear relation with constant coefficients, $\frac{a}{R}+\frac{b}{T}=1$, there is one, and only one, other curve which has the same principal normals as the first. The length on a principal normal between corresponding points of the curves is constant. The associated curves are called Bertrand curves. The theorem suffers exception when the curvature and torsion are both constant, namely, in the case of the ordinary helix. Here there is an infinity of Bertrand curves, all helices on the common principal normal surface. Bertrand, 'Journ de Math.,' 15 (1850); J. A. Serret, 'Journ. de Math.' 16 (1851).

The ordinary helix holds, relative to space curves, a position somewhat similar to that held by a circle relative to plane curves. The circle is the curve of constant curvature (torsion = 0) and the ordinary helix is the curve of constant curvature and constant torsion. At a point of a plane curve, one circle may be passed having contact of the second order with the curve, or, as one may say, the circle and curve have three consecutive points in common, and, in general, no more than three points. It is the circle of osculation of the curve. Through three consecutive points P, P_1, P_2 of a space curve a single infinity of ordinary helices may be passed, but none will have in general more than the three points in common with the curve. All elements that depend on three consecutive points are common elements of the curves, viz., tangent, plane of osculation, principal normal, circle of curvature, at P. Among the helices is one whose principal normal at P_1 coincides with the principal normal of the space curve at the same point. This helix has the same torsion and curvature as the space curve at P, and is called the osculating helix of the space curve at the point P.

The length of a finite portion of a curve defined by equations (2) rests upon the evaluation of a definite integral. If on the arc lying between M and P points are marked in succession proceeding from M toward P, viz., M, Q_1, Q_2, $\ldots$ Q_{n-1}, P, and the chords $MQ_1, Q_1Q_2, \ldots Q_{n-1}P$ are drawn, there will be formed an inscribed polygon, the length of which will vary with the number of inscribed points and their position. But if the number of sides of the polygon be indefinitely increased, and each side be indefinitely diminished, the length of the polygon will approach a definite limiting value. This definite limiting value is defined to be the arc length from M to P. If M corresponds to the parameter value $u=u_0$, and P to the general value u, the arc length s is the definite integral

$$s=\int_{u_0}^{u}\sqrt{\left(\frac{dx}{du}\right)^2+\left(\frac{dy}{du}\right)^2+\left(\frac{dz}{du}\right)^2}\,du.$$

Whence by differentiation the linear element of arc is

$$ds^2=\left[\left(\frac{dx}{du}\right)^2+\left(\frac{dy}{du}\right)^2+\left(\frac{dz}{du}\right)^2\right]du^2=dx^2+dy^2+dz^2.$$

The foregoing theory of the space curve contains implicitly the assumption that the arc

element ds is not zero; an assumption which holds for all real curves. In dropping the condition that ds may not be zero, one is led to certain imaginary curves defined by the differential equation

$$\left(\frac{dx}{du}\right)^2+\left(\frac{dy}{du}\right)^2+\left(\frac{dz}{du}\right)^2=0.$$

These curves are called minimal curves and are either minimal right lines or minimal twisted curves with tangents that are minimal right lines. The right lines

$$x=a_1+b_1u,\quad y=a_2+b_2u,\quad z=a_3+b_3u$$

satisfy the above differential equation when $b_1^2+b_2^2+b_3^2=0$.

The values of the constants b_1, b_2, b_3, taken subject to this condition, furnish a single infinity of minimal right lines lying on an imaginary cone with vertex at the point (a_1, a_2, a_3). The intersection of the cone by the plane of infinity is the imaginary circle at infinity. The minimal lines through any point of space are the lines joining the point to the points of the imaginary circle at infinity. The twisted minimal curves are all represented by the equations

$$x=\tfrac{1}{2}(1-u^2)f''(u)+uf'(u)-f(u),$$

$$y=\frac{i}{2}(1+u^2)f''(u)-iuf'(u)+if(u),$$

$$z=uf''(u)-f'(u).$$

The accents indicate differentiation with respect to u; $i=\sqrt{-1}$; and $f(u)$ is a function of the complex imaginary variable u. $f(u)$ is restricted only in that its third derivative must not be zero. Elements of the curve which do not essentially rest on ds can be obtained in the usual way, viz., tangent, plane of osculation, etc. As the plane of osculation contains two consecutive tangents, it touches the imaginary circle at infinity. The tangential surface of the minimal curve accordingly circumscribes the circle at infinity. Inversely, a minimal curve can be defined as the edge of regression of a developable surface circumscribing the imaginary circle at infinity. The introduction of the minimal right lines and the imaginary circle at infinity enables one to express certain metric relations in projective form. The minimal curves find very elegant application in the theory of minimal surfaces[1] (real).

The point P, to which all the developments have been attached, is supposed to be an ordinary point of the curve. A point is ordinary when this point and points on the curve in its immediate vicinity can be represented by the same three equations of form (2), each point corresponding to a single value of u. The three functions $\phi(u)$, $\chi(u)$, $\psi(u)$ must be developable in power series at the point, and the three first derivatives must not be simultaneously zero. As an example of a singularity it is obvious that these conditions are not satisfied by a point at which the curve intersects itself. The singularities of a twisted curve are discussed in Cayley, Collected Works, Vol. I, 8; Fine, Amer. Jour. of Math., 8; Staude, Amer. Jour. Math., 17.

4. *Classification and Literature.*—Curves are divided into algebraic and transcendental curves, according as their equations are or are not algebraic. The *order* of a space curve is the number of points of intersection (real or imaginary of the space curve by an arbitrary plane. The *rank* of the curve is the number of tangents intersected by an arbitrary straight line, i.e., it is the order of the tangential surface of the curve. The *class* of the curve is the number of planes of osculation that pass through an arbitrary point of space. At present there is no known system of elements which suffice to characterize the general space curve. There is no proper curve of the second order; there is one family of curves of the third order, there are *two* families of curves of the fourth order, a fact which puts in evidence that order of curve does not in itself suffice to characterize space curves. When to order is added the number of apparent double points, viz., the number of chords which can be drawn through an arbitrary point of space, a differentiation is effected, but this again fails in the case of curves of the ninth order. Cayley established formulas for the space curve corresponding to the Plucker formulas for plane curves. Cayley, Collected Mathematical Papers, Vol. I, p. 207.

The first systematic treatment of space curves was given by Clairaut in 1751, 'Traité de courbes à double courbure.' Among the older sources not hitherto mentioned are Lancret, 'Mémoires présentés . . . à l'Académie des sciences' (1806); de Saint-Venant, 'Journal de l'École polytechnique.' The more important treatises and texts that give more or less complete representations of the theory are Darboux, 'Leçons sur la théorie générale des surfaces' (Paris, 1887–1896); Laurent, 'Traité d'analyse,' 2, 7 (Paris); Bianchi, 'Lezioni di geom. diff. Pisa' (1885–86, translated into German by Lukat, Leipsic, 1899); Joachimsthal, 'Anwendung der Differential- und Integralrechnung auf die allgemeine Theorie der Flächen und der Linien doppelter Krummung' (Leipsic, 1890); Hoppe, 'Lehrbuch der anal Geom.' (Leipsic, 1880); Scheffers, 'Anwendung der Differential- und Integralrechnung auf Geometrie' (Leipsic, 1902); Salmon-Fiedler, 'Anal. Geom. des Raumes' (Leipsic, 1880); Schell, 'Allgemeine Theorie der Curven doppelter Krümmung in rein geometrischer Darstellung' (Leipsic, 1898); Salmon, 'Geometry of Three Dimensions.'—[1] See SURFACES, THEORY OF.

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Curves, Higher Plane.—A curve can be looked upon in many ways; geometrically as the intersection of two surfaces, as the locus of a moving point, or envelope of a moving line; analytically as a representation of an equation in point- or line-coordinates, and therefore as yielding a singly infinite system of points or lines. But if this view be adopted, the "curve" must not necessarily be regarded as identical with the system of points; for most curves (not all) have tangents, hence a curve yields also a system of lines, of equal importance with the system of points; a definition that lays stress on one system to the exclusion of the other is incomplete. This was recognized by Plücker ('Theorie der algebraischen Curven,' 1839, p. 200), in his statement of the dual generation of a curve: "If a point continually moves along a straight line, while the line continually rotates about the point, one and the same curve is enveloped by the line and described by the point." Clifford ('Math. Papers,' pp. 40–42)

treats the true curve as an undefined entity, of which the assemblages of points and lines are two distinct manifestations. The present tendency is towards this view, at least as regards an algebraic curve,—a curve whose equation, whether in point- or line-coordinates, is algebraic. A curve whose Cartesian equation cannot be reduced to an algebraic form, *e.g.*, $y=\sin x$, is non-algebraic or transcendental. It is convenient to treat first of algebraic curves.

If x, y satisfy an algebraic equation $f(x, y)=0$, it can be shown that $\frac{dy}{dx}$ has a definite value $\left(=-\frac{\partial f}{\partial x}:\frac{\partial f}{\partial y}\right)$ unless both $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ vanish. There is therefore a tangent, $Y-y=(X-x)\frac{dy}{dx}$, *i.e.*, $(X-x)\frac{\partial f}{\partial x}+(Y-y)\frac{\partial f}{\partial y}=0$; in homogeneous coordinates $X\frac{\partial f}{\partial x}+Y\frac{\partial f}{\partial y}+Z\frac{\partial f}{\partial z}=0$. The coordinates of the tangent are: $\xi:\eta:\zeta=-\frac{\partial f}{\partial x}:\frac{\partial f}{\partial y}:\frac{\partial f}{\partial z}$; the elimination of x, y, z from these equations and $f(x, y, z)=0$ gives an algebraic equation $\phi(\xi, \eta, \zeta)=0$, the line equation (tangential equation) of the curve. Thus the curve has two equations, both algebraic, a point equation of degree m, a line equation of degree n; these two numbers m, n, the order and class of the curve, are the number of points that lie on an arbitrary line, the number of tangents that pass through an arbitrary point; they belong respectively to the point system and the line system, not to the curve itself. A number that is more intimately associated with the curve is the genus, p, to be defined later.

An algebraic curve cannot break off; the tangent cannot suffer a sudden change in direction; no finite part of the curve can coincide with a straight line. Thus the normal character of an arc of an algebraic curve expresses gradual and continuous change of position (motion of point), gradual and continuous change of direction (motion of tangent), as stated by Plücker.

The number of terms in the equation $f(x, y, z)=0$ is $\frac{1}{2}(m+1)(m+2)$; the number of disposable constants is therefore $\frac{1}{2}(m+1)(m+2)-1$, *i.e.*, $\frac{1}{2}m(m+3)$. Hence passage through $\frac{1}{2}m(m+3)$ arbitrary points determines the curve; while if the curve passes through $\frac{1}{2}m(m+3)-q$ arbitrary points, the coefficients can be expressed linearly in terms of q parameters, and the curve has q degrees of freedom. If the points are not arbitrary, the curve may have mobility greater than q, or it may break up into curves of lower order. The theory is really that of the intersections of curves. Two curves of orders m, m' intersect in mm' points, for the elimination of z from the equations produces an equation of degree mm' for $x:y$. The m^2 intersections of two m-ics, u, v, do not determine an m-ic (although $m^2>\frac{1}{2}m(m+3)$), for all curves $u+kv=0$ pass through the points; the m^2 points impose precisely $\frac{1}{2}m(m+3)-1$ conditions. Similarly, the mm' intersections of C_m and $C_{m'}$ do not impose independent conditions on all curves; *e.g.*, the 20 intersections of C_4 and C_5 impose 14 conditions on a quartic, 17 on a quintic, 19 on a sextic, but 20 on all higher curves. The most convenient statement is: the quartic excess is 6, the quintic excess is 3, the sextic excess is 1 (Macaulay). The first notice of theorems of this character is due to Maclaurin (1720); the first explanation was given by Euler and Cramer (1748–1750). From these has arisen the whole modern theory of groups of points on a curve (geometry on a curve). (Scott, 'Bull. Am. Math. Soc.,' 2d series, v. 4, pp. 260–273; 1897–8.)

The fundamental theorem is the Cayley-Bacharach theorem (1843, 1886); a C_n through all except $\frac{1}{2}(l+m-n-1)(l+m-n-2)$ of the intersections of C_l and C_m will pass through the remainder unless these lie on a curve of order $l+m-n-3$. In particular ($l=n$) precisely $\frac{1}{2}(m-1)(m-2)$ of the intersections of a fixed C_m by a variable C_n are a consequence of the rest if $n>m-3$; but if $n\leqq m-3$, fewer than $\frac{1}{2}(m-1)(m-2)$ are a consequence. Thus no matter what the order of the cutting curve, the number of the induced intersections can never exceed $\frac{1}{2}(m-1)(m-2)$. This number, which limits the interconnexion of points on the curve of order m, is called the genus of the curve, and is usually denoted by p. The genus of a quartic, *e.g.*, is 3; 3 points on a quartic follow from 5 intersections with a conic, or from 9, 13, 17 intersections with a cubic, quartic, or quintic, and so on.

If a curve has multiple points, corresponding theorems hold and preserve their significance, provided the cutting curve is an adjoint curve, that is, a curve with a multiple point of order $k-1$ where the fixed curve has a multiple point of order k. The genus, the number p which limits the interconnexion, is in this case $\frac{1}{2}(m-1)(m-2)-\frac{1}{2}\Sigma k(k-1)$. (Macaulay, 'Proc. Lond. Math. Soc.,' v. 26, pp. 495–544; 1895; F. Hardcastle, 'Report on Point-Groups,' in progress in Proc. of the Brit. Asso.; Brill-Noether Bericht, 'Die Entwicklung der Theorie der algebraischen Functionen in alterer und neuerer Zeit,' 1894.)

Multiple points arise when two or more points of the system occupy the same position in the plane; according to the number of points that coincide, the point is double, triple, etc. Double points (dps) are nodes or cusps; a node is the coincidence of two non-consecutive points, a cusp is the coincidence of two consecutive points; similarly double tangents are either bitangents or inflexional tangents. The cusp and inflexional tangent are also called stationary point and line, on account of the effect of the singularity on the motion of the point and line by which the curve is described.

The coincidence of two points at P causes an arbitrary line through P to meet the curve in two points there; hence if P be taken as origin, the terms of the first degree in the equation will vanish. The conditions for a double point at x, y, z are therefore the vanishing of f, $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ $\left(\text{in homogeneous coordinates, of } \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z}\right)$. Two lines can be found to meet the curve in more than two points at P; these are the tangents; they are given by the terms of degree 2 equated to zero. Similarly the conditions for a k-point are the vanishing of the $\frac{1}{2}k(k+1)$ derivates $\frac{\partial^{k-1}f}{\partial x^\alpha \partial y^\beta \partial z^\gamma}$ $(\alpha+\beta+\gamma=k-1)$, and there are k tangents, lines which meet the curve in more than k points.

If the tangents at a dp are distinct, the point is a node, formed by the crossing of

simple branches, real or imaginary according as the tangents are real or imaginary. In this last case the point is detached from the main body of the curve, and is called an isolated point, or acnode, the visible crossing being called a node, or crunode. If the tangents are coincident, and meet the curve in precisely three points, the point is a cusp; if the coincident tangents meet the curve in more than three points, the singularity is complex.

Elimination of $x:y:z$ from $\frac{\partial f}{\partial x}=0, \frac{\partial f}{\partial y}=0, \frac{\partial f}{\partial z}=0$ gives a condition, $D=0$, to be satisfied by the equation of any curve that has a dp. Hence a general locus of order m has no point-singularities, and a general envelope of class n has no line-singularities. But a general envelope has point-singularities and a general locus has line-singularities; for the direction of a tangent, given by the value of $\frac{dy}{dx}$, is unchanged if $\frac{d^2y}{dx^2}=0$, *i.e.*, if

$$\frac{\partial^2 f}{\partial x^2}\left(\frac{\partial f}{\partial y}\right)^2-2\frac{\partial^2 f}{\partial x\partial y}\cdot\frac{\partial f}{\partial x}\cdot\frac{\partial f}{\partial y}+\frac{\partial^2 f}{\partial y^2}\left(\frac{\partial f}{\partial x}\right)^2=0.$$

This condition, and $f=0$, are only two equations, and consequently no condition is imposed on the locus by the existence of line-singularities.

If a curve of order m, class n, has ν nodes, κ cusps, τ bitangents, ι inflexional tangents, these numbers are connected by Plücker's equations. The tangent at x, y, z is

$$X\frac{\partial f}{\partial x}+Y\frac{\partial f}{\partial y}+Z\frac{\partial f}{\partial z}=0;$$

this passes through x', y', z' if x, y, z lies on the curve $x'\frac{\partial f}{\partial x}+y'\frac{\partial f}{\partial y}+z'\frac{\partial f}{\partial z}=0$, the polar of x', y', z' with respect to f. Since this curve, $Jf=0$, is of order $m-1$, it meets f in $m(m-1)$ points; two of these lie at every node, three at every cusp; hence the number of tangents from x', y', z' is

$$n=m(m-1)-2\nu-3\kappa. \quad . \quad . \quad (1)$$

Similarly from the line-equation,

$$m=n(n-1)-2\tau-3\iota. \quad . \quad . \quad (1')$$

The condition that the tangent at x, y, z be stationary becomes in homogeneous coordinates

$$\begin{vmatrix} \frac{\partial^2 f}{\partial x^2} & \frac{\partial^2 f}{\partial x\partial y} & \frac{\partial^2 f}{\partial x\partial z} \\ \frac{\partial^2 f}{\partial x\partial y} & \frac{\partial^2 f}{\partial y^2} & \frac{\partial^2 f}{\partial y\partial z} \\ \frac{\partial^2 f}{\partial x\partial z} & \frac{\partial^2 f}{\partial y\partial z} & \frac{\partial^2 f}{\partial z^2} \end{vmatrix}=0;$$

the point of contact must lie on this curve, $H(f)=0$, the Hessian of f, of order $3(m-2)$. At a node on f, H has a node with the same tangents; at a cusp, H has a triple point, composed of two branches touching the cuspidal tangent with one branch cutting it; the numbers of intersections are 6 and 8. Hence

$$\iota=3m(m-2)-6\nu-8\kappa, \quad . \quad . \quad . \quad (2)$$

and reciprocally

$$\kappa=3n(n-2)-6\tau-8\iota. \quad . \quad . \quad . \quad (2')$$

Any one of these four equations can be obtained algebraically from the others. From these we can find also (3 and 3′) expressions for τ in terms of m, ν, κ, and for ν in terms of n, τ, ι.

These six are Plücker's equations; three only are independent. It must not however be supposed that we can choose any three of the numbers arbitrarily. There is a limit to the number of dps that a proper curve can have; $\nu+\kappa\geqslant\frac{1}{2}(m-1)(m-2)$. For if the curve had one more, a curve of order $m-2$ could be passed through the dps and $m-3$ other points on the curve; but this would have with f intersections in number $2[\frac{1}{2}(m-1)(m-2)+1]+m-3$, *i.e.*, $m(m-2)+1$, which is impossible. A curve can actually have this number of dps; it is then called rational (or unicursal), because the coordinates of any point can be expressed rationally in terms of a parameter, as follows: The dps and $m-3$ other points on f determine $(m-2)$-ics with one degree of freedom, a system $u+kv=0$. Of the $m(m-2)$ intersections of one of these with f, all except one are at the fixed points; the coordinates of the one remaining variable intersection are therefore given rationally in terms of the parameter k by $f=0, u+kv=0$.

If the curve has not this number of dps, let it have $\delta(=\nu+\kappa)$; the number $\frac{1}{2}(m-1)(m-2)-\delta$, which has already been given as the genus, was originally called the deficiency of the curve (Cayley).* From Plücker's equations we find

$$\tfrac{1}{2}(m-1)(m-2)-\nu-\kappa=\tfrac{1}{2}(n-1)(n-2)-\tau-\iota,$$

i.e., the point deficiency and the line deficiency are equal; the deficiency (or genus) does not belong specially to the point system or the line system. In particular, if the curve is rational quâ locus, it is rational quâ envelope. If we introduce p for the genus, the equations assume a convenient form,

$$n+\kappa=2m+2(p-1), \quad m+\iota=2n+2(p-1),$$

$$m(m-3)-2(\nu+\kappa)=2(p-1)=n(n-3)-2(\tau+\iota).$$

There are other limitations on these numbers, but the theory is not complete. Clebsch proved (Crelle, v. 64, p. 51; 1864) that the number of cusps on a rational curve cannot exceed $\frac{3}{2}(m-2)$; the more general question as to the maximum number of cusps for a curve of assigned order awaits solution.

So far the singularities have been supposed to be simple. A multiple point of order higher than the second is, in a certain sense, equivalent to a number of simple singularities. If the tangents at a k-point are distinct, the point arises from the crossing of k branches; these cause $\frac{1}{2}k(k-1)$ intersections, nodes by the geometrical definition. It can be shown that such a point reduces the class of the curve, the number of inflexions, and the genus, by $2\times\frac{1}{2}k(k-1)$, $6\times\frac{1}{2}k(k-1)$, $\frac{1}{2}k(k-1)$ respectively. Thus not only is the point explained geometrically by $\frac{1}{2}k(k-1)$ nodes, but as regards Plücker's equations it is equivalent to these nodes. Nevertheless the point cannot be replaced by these nodes for all purposes, *e.g.*, as regards the number of conditions; the k-point imposes $\frac{1}{2}k(k+1)$ conditions, whereas the nodes would impose $\frac{3}{2}k(k-1)$, *i.e.*, $\frac{1}{2}k(k+1)+k(k-1)$. It is an im-

* During the last thirty years the whole theory of plane algebraic curves has been modified in important points by the influence of the theory of functions, in particular, this has shown the significance of the genus.

portant fact that this equivalence does hold as regards the conditions imposed on adjoint curves; the presence of the $(k-1)$-point on the adjoint imposes $\frac{1}{2}k(k-1)$ conditions, equal to the number that would be imposed on the adjoint by $\frac{1}{2}k(k-1)$ separate nodes on f.

If the tangents are not distinct, the matter may become very complicated. The multiple point immediately revealed by the equation may be but one of a series of multiple points indefinitely close together, and the singularity then involves also multiple tangents. The determination of the point- and line-components, the "analysis of higher singularities," has received much attention. If the singularities are regarded as singularities of the equation, the question is properly considered from the algebraic standpoint. At an ordinary point of the curve, y can be expanded in an ascending series of positive integral powers of x, provided $x=0$ is not the tangent; at a k-point the process is not directly applicable, it requires some modifications, and then leads to k expansions, with exponents either integral or fractional. An expansion with fractional exponents, whose L.C.D. is q, is accompanied by the $q-1$ conjugate expansions, thus forming a cycle of order q (Puiseux). The integral expansion is a cycle, $q=1$, and the k-point is represented by a number of cycles of orders $q_1, q_2, q_3, \ldots$, where $\Sigma q = k$. The number of cusps in a cycle is $q-1$; this agrees with the known facts about the simple cusp ($y=x^{\frac{3}{2}}$, $y=-x^{\frac{3}{2}}$), and is accepted as the algebraic definition of cusps. The algebraic definition of a node is indirect; ν is determined so that $2\nu+3\kappa$ shall be equal to twice the total number of intersections of all the branches (the discriminantal index of the singularity); it is proved that this definition yields always a positive integral value for ν. (Chrystal, 'Algebra,' v. 2, 1889, pp. 359–371; Harkness and Morley, 'Treatise on the Theory of Functions,' 1893; pp. 127–151; Brill-Noether Bericht, pp. 367–402 for full references.)

The process as outlined above, dealing with the expansions as a whole, simply enumerates the components, algebraically defined, of a singularity; it affords no clue to the structure. This structure can however be put in evidence by means of the critical exponents of the expansions, those in whose denominators a new factor appears. These show that the dps are combined into certain multiple points, and thus they lead to an algebraic description of the singularity. (H. J. S. Smith, 'Proc. Lond. Math. Soc.,' v. 6, pp. 153–182; 1876; Halphén, 'Mém. prés. à l'Ac. des Sc. de Paris,' v. 26, 1877; Zeuthen, 'Math. Ann.,' v. 10, pp. 210–220, 1876.) A different treatment of the expansions, due to Noether, gives a clearer idea of the structure.

By a geometrical process, depending on the simplest Cremona transformation (see below), it is possible not only to enumerate the multiple points and lines contained in any singularity, but also to construct a penultimate form to indicate the arrangement of these components. (Scott, 'Am. J. Math.,' v. 14, pp. 301–325; v. 15, pp. 221–243; 1892–3.)

The various processes lead to the following conclusions as to the content of a complex singularity. The point-equation by its lowest terms gives the order, k, of the singularity; the line-equation gives the class, l. If the singularity has all its tangents coincident (if it has not, it can be broken up into simpler ones) then order + class = number of intersections with the tangent at the point, and thus the class is known without reference to the line-equation. Coincident tangents may lead to other multiple points, or to chains of multiple points, contained in the singularity; if the total number of dps in these is h, the singularity has h latent double points. It has also latent double lines, h' in number, and it has been proved that $h'=h$. The singularity of order k, class l, excess h (supposed irreducible), involves $\frac{1}{2}k(k-1)+h$ dps, of which $k-1$ are cusps, and $\frac{1}{2}l(l-1)+h$ dls, of which $l-1$ are inflexional tangents. The singularity is equivalent to these components as regards Plücker's equations and as regards the genus; but not in the number of conditions imposed on the curve.

It is obvious that the multiple points of a curve cannot always be chosen arbitrarily. A sextic, *e.g.*, can have 10 dps; but these, chosen arbitrarily, would impose 30 conditions, whereas 27 determine the sextic. The 27 conditions cannot be imposed by 9 dps arbitrarily chosen, for these would determine only the reducible sextic $v^2=0$, where v is the cubic through the 9. If the 9 admit of a proper sextic, $u=0$, they allow one degree of freedom, for all curves $u+kv^2=0$ satisfy the conditions. Hence the 9 are not arbitrary. The theorems of geometry on a curve, and linear systems of curves, lead to general results of this character, but there are evidently many special theorems as to the position of singularities to be formulated for curves of specified order or class.

By means of a birational transformation, either of the whole plane or of the one curve, it is possible to change any curve into one, in general of different order, with no point-singularities except simple nodes. Let P, (x, y, z) become P', (x', y', z') (represented on a second plane for distinctness), where x', y', z' are given by

$$x' : y' : z' = \phi_1(x, y, z) : \phi_2(x, y, z) : \phi_3(x, y, z);$$

then corresponding to any point P of the first plane Π there is one point P' of the second plane Π'; but the converse does not hold. The ∞^2 straight lines of Π', $lx'+my'+nz'=0$, correspond to the ∞^2 transformation-curves in Π, $l\phi_1+m\phi_2+n\phi_3=0$, of order σ; to a single point P' of Π', given as the intersection of two lines, there correspond in Π all the κ variable intersections of two ϕ's, $P_1, P_2, \ldots, P_\kappa$; the correspondence of the two planes is said to be "κ-to-one", $(\kappa, 1)$. Since the ϕ's may have fixed points, simple or multiple, $A_1, A_2, \ldots$ of orders $\rho_1, \rho_2, \ldots$, κ may be less than σ^2.

If $\kappa=1$, *i.e.*, if one point of Π corresponds to one point of Π', the equations of transformation are reversible; not only is Π' expressed rationally in terms of Π by these equations, but also Π is expressed rationally in terms of Π' by

$$x : y : z = \psi_1(x', y', z') : \psi_2(x', y', z') : \psi_3(x', y', z'),$$

the reverted equations, which are of the same order σ. The transformation is a birational transformation of the *plane*, usually called a Cremona transformation. In the simplest Cremona transformation the ϕ's are conics through three fixed points; the equations of transformation are therefore of the second degree; this is a reversible quadratic transformation. An im-

[illegible]ant theorem is that every Cremona trans[illegible] can be accomplished by a succession [illegible] reversible quadratic transformations.

If $n>1$, the equations cannot be reverted; the transformation is not birational for the whole plane. But if I_1 trace a curve F, I'' traces the corresponding curve F', the points $I'_2 \ldots I'_k$ trace another curve, f (different from F), the companion curve of F. If we ignore all of H except F, that is, if we confine ourselves to the two curves F, F', the correspondence becomes one-to-one, with the help of the equation $F=0$ the equations of transformation can be reverted, and the transformation becomes birational. Such a birational transformation of a *curve* is called a Riemann transformation. Thus a Riemann transformation is birational for the one curve only, while a Cremona transformation is birational for the whole plane, and therefore for every curve in the plane.

The importance of transformation is due to its effect on singularities. The fixed points $A_1, A_2, A_3, \ldots$ in H have no correspondents in H', but a point close to A_i in a determinate direction has a determinate correspondent, and if a point describes a small circuit about A_i, the corresponding point in H' describes a curve α_i', rational and of order ρ_i; this is a fundamental curve of the second plane. If F passes k times through A_i, F' cuts α_i' in k points; if the k directions through A_i are distinct these points are all separate, and thus the multiple point on F is dissipated. If any of the k tangents at A_i coincide, F' has contact with α_i', or it may have a multiple point on α_i', but of a less complex character than the original at A_i; and by repetitions of the process the singularity is made to disappear.

But new singularities may arise, due to fundamental curves in the first plane. Such fundamental curves might be defined by means of the reverted equations of transformation; but as it is not usually convenient actually to form these (at least in the case of a Riemann transformation), it is simpler to adopt an independent definition. An irreducible curve β that meets the transformation curves ϕ only at their fixed points is a fundamental curve of the system; all points on such a curve, β, correspond to a single point B' of H', or, more precisely, to points close to B' in different directions. If then F meets β in h points, F' has at B' a multiple point of order h.

Finally, new multiple points, in general only simple nodes, arise on F' owing to the passage of F through associated points of the first plane (intersections of two ϕ's). Such passages are indicated by intersections of F with its companion curve f; hence they are in general inevitable.

By either transformation, Cremona or Riemann, the multiple points on the given curve can be dissipated, whether the tangents are distinct or coincident. A Cremona transformation-system, however, always has fundamental curves, whose number is equal to that of the fundamental points (Bertini, 'Palermo Rendiconti,' v. 3, pp. 5–21, 1889); hence when F is transformed, new multiple points, possibly of high order, will arise unless the Cremona system is specially chosen. A Riemann transformation-system, on the contrary, need not have any fundamental curves, hence in general the new multiple points that arise will be simple nodes.

A Riemann transformation, however, requires the elimination of $x:y:z$ from the equations of transformation, of degree σ, together with $F=0$, of degree m, whereas a Cremona transformation is accomplished by the direct substitution of $\phi_1(x',y',z')$, $\phi_2(x',y',z')$, $\phi_3(x',y',z')$ for x, y, z. (Salmon, 'Higher Plane Curves,' chap. 8 in the German translation by Fiedler, also references at end; Scott, 'Quart. Jour.,' v. 29, pp. 329–381, 1898; v. 32, pp. 209–230, 1900.)

When a curve is subjected to a birational transformation of either kind, Cremona or Riemann, the induced points of a group of intersections transform into the induced points of the transformed group; this affords one proof (Bertini) of the important theorem that two curves which are birationally connected are of the same genus. The converse is not true; curves of the same genus cannot necessarily be birationally transformed into one another. A curve of genus p depends in general on $3(p-1)$ characteristic constants, the so-called moduli; if these are equal for two curves, then the two are birationally equivalent. (Clebsch-Lindemann, 'Vorlesungen uber Geometrie,' 1876, pp. 709–720.)

Closely connected with this is the transformation of a curve into itself. This however is more conveniently considered as an independent theory, that of correspondence of points on a curve. (Cayley, 'Proc. Lond. Math. Soc.,' 1865–6; no. 385, v. 6, Coll. Papers; 'Phil. Trans.,' 1867–8; no. 407, v. 6, Coll. Papers; Brill, 'Math Ann.,' v. 36, pp. 321–300, 1890; Brill-Noether Bericht, pp. 530–531.)

An entirely distinct class of investigations deals with the form of curves (topology, analysis situs). The method employed is usually variation of the coefficients, by which the curve is derived from a known reducible curve of the same order. In this manner Klein proved ('Math. Ann.,' v. 10, pp. 199–209, 1876) that the numbers of the real singularities are connected by the relation

$$m+I+2T'=n+K+2A',$$

where I, K, T', A' are the numbers of real inflexions and cusps, isolated tangents and isolated points, on a curve of order m, class n. Hence if the curve has no point-singularities, $I+2T'=m(m-2)$, from which it follows, since $n=3m(m-2)$, that not more than one third of the inflexions of a non-singular locus can be real. Klein's relation has been proved algebraically by Brill ('Math. Ann.,' v. 16, pp. 348–408, 1880), and extended to complex singularities. There is no corresponding restriction on the bitangents; all may be real.

Topological theorems relate in general to the nature, number, and arrangement of the distinct parts (circuits) of a curve. The first division of circuits, due to von Staudt, is into odd and even, for the number of real intersections with an arbitrary line is always odd or always even. An odd circuit necessarily extends through infinity. Simple examples are the oval and the infinite branch of a bipartite cubic $y^2=(x-a)(x-b)(x-c)$; but circuits may be much more complex. Let the minimum number of real intersections with a straight line be called the index of the circuit. Zeuthen showed ('Math. Ann.,' v. 7, p. 426, 1874) that a quartic may have a circuit of index 2, with two nodes; Cayley showed ('Phil. Mag.,' v. 29,

1865; no. 361, v. 5, Coll. Papers) that a sextic may have a circuit of index 2, without multiple points. It has been proved (Scott, 'Trans. Am. Math. Soc.,' v. 3, pp. 388–398, 1902) that for every order m there exists a curve ($p=0$ or 1), composed of a single circuit of index $m-2$, or $m-4$, $m-6$, down to 0 or 1, according as m is even or odd; any such circuit of index k can be produced by a simple process of linking from k odd circuits. The Zeuthen quartic circuit finds its place in this category, it is due to the linking of two odd circuits; but the non-singular sextic circuit is entirely different in character, and a general theory of such circuits is still to be suggested.*

The possible number of circuits is $p+1$ (Harnack, 'Math. Ann.,' v. 10, pp. 189–198, 1876); for every order m there exist curves with this maximum number of circuits, and with every smaller number.

The question of arrangement has been considered only with reference to circuits that can be projected into the finite, the so-called ovals. Hilbert ('Math. Ann.,' v. 38, pp. 115–138, 1891) discussed curves with «nested ovals», whose simplest type is the annular quartic, composed of one oval inside another; the number of nested branches cannot exceed $\frac{1}{2}(m-2)$ or $\frac{1}{2}(m-3)$, according as m is even or odd; moreover, non-singular curves with the maximum number of circuits and the maximum number of nested ovals do exist.

Hilbert draws attention to the arrangement of the eleven ovals of a non-singular sextic ($p=10$); he states that one of these must lie inside another (p. 118). It appears highly probable (V. Ragsdale, 'Bull. Am. Math. Soc.,' v. 11, p. 464, 1905) that this unproved theorem of Hilbert's is the simplest case of a general law in accordance with which at least $\frac{1}{2}(q-1)(q-2)$ of the circuits of a non-singular curve of order $2q$ must lie inside some of the remaining $q^2+\frac{1}{2}(q-1)(q-2)$.

Thus as regards circuits the only question completely solved is that of the possible number; their nature, their arrangement as regards one another, or as regards the straight lines of the plane (on which depends the answer to the inquiry whether all the even circuits can be projected simultaneously into the finite), have been hardly touched upon, though there must be many interesting results awaiting discovery.

Although the general theory of polars belongs properly to the theory of algebraic forms, it supplies convenient expression for some geometrical facts. The first polar of x', y', z' is the curve of order $m-1$, $Jf=0$, where J denotes the operator $x'\frac{\partial}{\partial x}+y'\frac{\partial}{\partial y}+z'\frac{\partial}{\partial z}$. A second operation with J produces the second polar, $J^2f=0$, of order $m-2$, and so on; thus any point has $m-1$ polars, of which the last two are the polar conic and polar line. The polar conic of a dp is simply the pair of tangents; the polar conic of an inflexion consists of the inflexional tangent together with another line which does not pass through the inflexion; thus in both cases the polar conic has a dp. It is easily proved that if the polar conic of B has a dp A, the first polar of A has a dp B. This suggests three derived curves: the locus of points A, the Steinerian, of order $3(m-2)^2$; the locus of points B, the Hessian, of order $3(m-2)$; the envelope of the line AB, the Cayleyan. Thus, *e.g.*, the curve by which the points of inflexion are determined, the Hessian, is geometrically defined; every point is in a known geometrical relation to f. On the other hand, though it is known that a curve of order $(m-2)(m^2-9)$ can be passed through the points of contact of the bitangents, no geometrical definition of any such curve has yet been formulated. The curve is of course not unique; what is needed is a geometrical definition of some one curve that shall meet f only at these points of contact, and at the multiple points, in such a manner as to account for the whole number of intersections. (Cayley, 'Coll. Papers,' v. 11, pp. 471, 473.)

The metric properties of a curve are important in particular questions, though not in the general theory. The curve has m points at infinity; at each of these there is a tangent, which is an asymptote unless it lies entirely at infinity. Consequently for every non-repeated direction to infinity there is an asymptote; for a repeated direction there may or may not be asymptotes. A twofold direction, *e.g.*, may be accounted for either by contact with the straight line at infinity, with no asymptote, or by a dp at infinity, with two asymptotes, distinct or coincident. A branch that has a real asymptote is called hyperbolic; a branch that has contact with the straight line at infinity, whether at a simple point or at a multiple point, is called parabolic.

The curve has n imaginary tangents from each of the circular points; these by their intersections determine the n^2 foci, of which n are real (Plücker's definition, 1833); but the number of foci is diminished if the curve passes through the circular points or touches the straight line at infinity.

There is a theory of diameters; these are the polars of points at infinity. The polar line of a point at infinity is the locus of the mean center of the m intersections of the curve with chords through the point (proved by Newton for cubics); this property of a diametral line is analogous to the bisection property of a diameter of a conic. The other polars (curvilinear diameters) also can be explained in terms of the segments of the chords. (Salmon, H. P. C., chap. 4.)

The first enumeration of varieties of a curve of any order beyond the second is Newton's 'Enumeratio linearum tertii ordinis,' 1706. He proves that all the 72 varieties (it should be 78) can be obtained by projection from the five types of cubic with an inflexional tangent at infinity (divergent parabolas), bipartite, unipartite, crunodal, acnodal, and cuspidal. Similarly when once the distinct types of a curve of any order have been enumerated, the varieties can be obtained at once. There are 144 types of quartic (R. Gentry, 'On the forms of plane quartic curves,' 1896); the number for higher curves, even for quintics, must be very great. It does not appear that any special purpose would be served directly by the enumera-

* For the connection with symmetric Riemann surfaces, see Klein, 'Math. Ann.,' v. 7, pp. 558–566, 1874; v. 14, pp. 445, 446, 1876; 'Über Riemann's Theorie der algebraischen Functionen und ihrer Integrale,' 1882; pp. 66–69 in F. Hardcastle's translation; 'Lectures on Mathematics' The Evanston Colloquium' 1894, pp. 30–32. Harkness and Morley, 'Treatise on the Theory of Functions,' pp. 274–276.

tion of these, though there are matters of interest on which this might throw light. For example the theory of the inflexional tangents of a cubic has been thoroughly worked out; suitably taken in threes they determine three inflexions on a straight line, the three tangents and this line form a framework for the curve. As regards quartics, a closely corresponding theory is that of the bitangents, suitably taken in fours, these determine sets of eight points on the quartic, each set lying on a conic, the curve is conveniently referred to the four bitangents and the conic. What is the generalization of this? even for the quintic, this is as yet unknown.

A more profitable classification of curves is according to their genus, and the values of the $3(p-1)$ characteristic constants, or moduli. Rational ($p=0$), elliptic ($p=1$), and hyperelliptic curves (which include among others all curves with $p=2$) have been extensively treated. (Clebsch-Lindemann, pp. 883–903, 903–915, 915–923, also 711–712, 717–720; Loria, 'Il passato ed il presente delle principali teorie geometriche,' 2d edition, 1896, pp. 76–79 for references.)

Investigations on special classes of algebraic curves are too numerous to mention; in particular, bicircular quartics and cartesians (with nodes, or cusps, at the circular points) have a literature to themselves. The Steiner curve, or deltoid (hypocycloid with three cusps), is perhaps the most interesting individual among algebraic curves, on account of its geometrical properties. (Loria, 'Il passato,' etc., pp. 61–76.)

If a curve has an equation that cannot be expressed in finite algebraic form it is said to be transcendental. Algebraic and transcendental curves, however, are by no means as widely separated as this would suggest; *e.g.*, the equation $r=\sin b\theta$ represents curves which are algebraic when b is rational, transcendental for all other values of b. Thus the algebraic curves of the series bear to the whole series the relation that is borne by rational numbers to all numbers; they are isolated members, whose number is insignificant. The same is probably true of all algebraic curves; they are isolated members of transcendental families. It is not surprising, therefore, that there is as yet no general theory of transcendental curves. Results proved for algebraic curves by means of the whole equation (*e.g.*, Plucker's equations) are not applicable to transcendental curves, which from one point of view are of infinite order; while results that depend only on a small arc are in general applicable. Such knowledge as we have of transcendental curves is obtained from metric investigations of special curves.

Among these special curves, one of the most important divisions is that of roulettes. A roulette is traced by a point attached to a curve, which itself rolls without sliding on a fixed curve. A point on the circumference of a circle which rolls on a straight line traces a cycloid; if the circle rolls in or on a circle the roulette is an epicycloid or hypocycloid. If the point is not on the circumference of the rolling circle, the curve is a trochoid, epitrochoid, or hypotrochoid. The epicycloid or hypocycloid is algebraic if the radii of the two circles are commensurable. An important theorem, due to Descartes, is that the normal to a roulette at any point passes through the corresponding point of contact of the rolling curve with the fixed curve.

Some of the best known of the transcendental curves are the spiral of Archimedes, $r=a\theta$, the hyperbolic spiral, $r\theta=a$, the logarithmic spiral, $r=a^\theta$, which cuts all its radii vectores at a constant angle, the logarithmic curve, $y=a^x$, or $x=m\log y$, which is noteworthy on account of the curious discontinuity of the negative branch (Salmon, H. P. C., chap. 7); the catenary, $y=\frac{c}{2}\left(e^{\frac{x}{c}}+e^{-\frac{x}{c}}\right)$, the form assumed by a chain hanging from two points of support; the tractrix, $x=c\log\frac{c+\sqrt{c^2-y^2}}{y}-\sqrt{c^2-y^2}$, which cuts all the tangents to the catenary orthogonally, this curve is of special interest on account of the use made of it by Beltrami ('Saggio d'interpretazione della geometria non-euclidea,' 1868) (For detailed references see Loria, 'Specielle algebraische und transscendente ebene Kurven,' trans. by Schutte; 1902.)

All the curves hitherto mentioned have tangents, which vary continuously from point to point; but there are curves, graphical representations of certain functions, which differ in this respect. A curve may have a tangent at every point, which yet may not vary continuously; *e.g.*, "polygonal lines," $y=\int_0^x f(x)dx$, where $f(x)$ is a certain arithmetic functions; such a curve is composed of a number of segments of straight lines. (Gravé, 'Comptes-rendus,' v. 127, pp. 1005–1007, 1898.)

There are curves which are continuous, and yet have no definite tangents; the classic example, due to Weierstrass, is $y=\sum_{n=0}^{n=\infty} b^n\cos\alpha^n x\pi$, (Wiener, 'Crelle,' v. 90, pp. 221–252, 1881). The explanation of the impossibility of assigning the tangent at any point is that in any finite interval the curve makes an infinity of oscillations.

Another possible deviation from the natural idea of a curve was discovered by Peano ('Math. Ann.,' v. 36, pp. 157–160, 1890). He shows that it is possible to construct functions $\phi(t)$, $\psi(t)$ of a single variable such that the points $x=\phi(t)$, $y=\psi(t)$ occupy all positions inside a given square; thus a curve can cover a plane area. (For detailed discussion of such curves, see E. H. Moore, 'On Certain Crinkly Curves,' Trans. Am. Math. Soc., v. 1, pp. 72–90, 1900.)

These examples show clearly that the most general idea of a curve is far removed from the comparatively simple idea first presented in analytical geometry. The definition at present accepted of a plane curve without multiple points, due to Jordan and Hurwitz, has been thus expressed in English (by Osgood): "a set of points which can be referred in a one-to-one manner and continuously to the points of a segment of a right line, inclusive of the extremities of the segment, if the curve is not closed, and to the points of the circumference of a circle if the curve is closed." (Hurwitz, 'Verhandlungen des ersten internationalen Mathematiker-Kongresses in Zurich,' 1897, pp. 102, 103.)

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Curwen, kėr'wĕn, **John,** English musical educator: b. Heckmondwike, Yorkshire, 14 Nov. 1816; d. Heaton, Mersey, England, 26 May 1880. He became a minister of the Independent body, being in 1844 elected pastor at Plaistow, Essex. Here he developed and promoted the Tonic Sol-fa method, and brought the system still more before public attention by the publication of his 'Grammar of Music' and 'Lessons in Music' in 'Cassell's Popular Educator.' In 1853 he established the Tonic Sol-fa Association, and in 1862 the Tonic Sol-fa College. He published, among other works connected with the system, the 'Child's Own Hymn-Book'; 'The Standard Course of the Tonic Sol-fa Method'; 'How to Observe Harmony.'

Curwen, John Spencer, English musical writer: b. Plaistow, Essex, 30 Sept. 1847. He is a son of John Curwen (q.v.), and has been editor of the 'Music Herald' from 1866. He was educated at the Royal Academy of Music, becoming president of the Tonic Sol-fa College in 1880, and has traveled much in Europe and America investigating the subject of music in schools. He has published: 'Studies in Worship Music'; 'Memorials of John Curwen'; 'The Boy's Voice'; 'School Music Abroad'; 'Music at the Queen's Accession.'

Curzola, koor'dzō-lä, Austria, the most beautiful of the Dalmatian islands, in the Adriatic, stretching west to east about 23 miles, with an average breadth of four miles; area, 85 square miles. It is covered in many places with magnificent timber. The fisheries are very productive.

Curzon, George Nathaniel (Baron Curzon of Kedleston), English viceroy in India: b. Kedleston 11 Jan. 1859. He was educated at Eton and Balliol College, Oxford; became assistant private secretary to the Marquis of Salisbury in 1885, and next year was elected member of Parliament for the Southport division of Lancashire, which he represented till 1898. He was under-secretary for India in 1892, and in 1895 became under-secretary of state for foreign affairs. In 1898 he was appointed viceroy of India, and at the same time created a peer (in the Irish peerage) by the style of Baron Curzon of Kedleston. His published works are: 'Russia in Central Asia in 1889 and the Anglo-Russian Question' (1889); 'Persia and the Persian Question' (1892); 'Problems of the Far East: Japan — Corea — China' (1894). As viceroy his aim throughout has been to reduce to a minimum the minute and report writing, and run the railways, the post and telegraph services and other large government monopolies in accord with the needs and spirit of the age. Owing to a disagreement with Lord Kitchener over army matters, he resigned as viceroy 20 Aug. 1905.

Cusa, koo'sä, or **Cusanus, Nikolaus** (originally **Nikolas Chrypffs,** or **Krebs**), German ecclesiastic: b. Kues, near Treves, 1401; d. Todi, Umbria, Italy, 11 Aug. 1464. As archdeacon of Liège he took the anti-papal side at the Council of Basel; but was ultimately bishop of Brixen in Tyrol, cardinal, and papal legate to Constantinople. He exposed the false Isidorian decretals, denounced perverted scholasticism in 'De Docta Ignorantia,' taught that the earth went round the sun, and in his pantheistic tendencies was a precursor of Giordano Bruno.

Cusack, Mary Frances, Irish writer; better known as the Nun of Kenmare: b. Dublin 6 May 1820; d. 7 June 1899. Originally a Protestant she became a Roman Catholic, and joined the Poor Clares, one of the sisterhoods of Saint Francis, and for 23 years conducted a convent of the order at Kenmare. When in 1884 she established the Sisters of Peace, an order similar to the Poor Clares, but with a wider range, not only did Leo XIII. sanction the work, but she received the hearty support of Christians, both Catholic and Protestant. She visited the United States in 1886. Among her many published books are: 'Student's History of Ireland'; 'Woman's Work in Modern Society'; 'The Pilgrim's Way to Heaven'; 'Jesus and Jerusalem'; lives of Saint Patrick, Daniel O'Connell, etc.

Cuscatlán, Salvador, a department bounded on the north by the departments of Chalatenango and Cabañas, on the east by the same departments and San Vicente; on the south by San Vicente and La Paz, and on the west by the department of San Salvador. The greater part of its surface is covered by lofty mountain ranges separated by narrow valleys; toward the north and northeast, however, near the Cuezalapa and Lempa rivers, there are comparatively level districts. The department was formed in 1835, and was originally much more extensive than it is at present (that is, 1,078 square miles), including until 1855 all of the Chalatenango region, and until 1875 a portion of what is now Cabañas. It is an agricultural country, the chief products being coffee, sugar, indigo, rice, tobacco, starch, cheese, and cereals. Twice each year the people gather from all parts, in Cojutepeque at the Feast of Saint John, 29 August, and at Suchitoto, 8 December, to exchange native products for foreign merchandise. The capital, Cojutepeque (pop. about 8,000), is situated near the summit of an extinct volcano, 2,614 feet above sea-level. Its streets are narrow and crooked, but the suburbs are beautiful. It has a town-hall, hospital, public school, four churches, public baths, etc. There are 17 towns in the department, the more important being Suchitoto, San Pedro, Perulapán, Tenancingo, San Rafael, and Guayabal. Pop. (1901) 72,000.

Cusco-bark, or **Cuzco-bark,** the bark of *Cinchona pubescens,* which comes from Cuzco, in South America, and is exported from Arequipa. It contains a peculiar alkaloid called cusco-cinchonine, or cusconine, which resembles cinchonine in its physical qualities, but differs from it in its chemical properties. When applied medicinally it excites warmth in the system, and is therefore recommended in cold intermittents and low typhoid states.

Cuscus, kŭs'kŭs, a marsupial native to the islands of the Australian group and New Guinea. It is generally about the size of a house cat; has a small head, large eyes, and a dense coat of fur, often pure white irregularly flecked with black, though this is variable. There are several distinct species. The food of all seems to be generally leaves and fruit, together with birds and other small animals. They frequent only forests of large trees, often swinging themselves from bough to bough by their long prehensile tails. They belong to the family of the phalangers (q.v.); and the genus *Cuscus* embraces a number of species, differing in habi-

tat and color. The best known species perhaps is *Cuscus chlorinis*.

Cuscutaceæ. See DODDER.

Cush, kŭsh, in the Old Testament, the eldest son of Ham, also a country frequently mentioned. Cush, as a country, appears to be African in most passages, and it is generally believed that the country intended can be no other than the region in Africa, south of Egypt, in ancient times designated more or less loosely as Ethiopia, and corresponding to the modern Nubia and northern Abyssinia. That it adjoined Egypt is shown by the passage in Ezekiel which states that the desolation of Egypt is to extend 'from the tower of Syene unto the border of Cush.' In a number of passages, also Cush, or its inhabitants, is mentioned in connection with Egypt. Cushites, for example, came out of Egypt with Shishak against Jerusalem. In other places again it is evident that the name Cush must be understood as referring to some part of Arabia. That several localities should be called by the same name may be explained by the frequent migrations of the early nations, who would give their own name to the countries into which they successively arrived.

Cushew-bird, kŭsh'ō-bĕrd, another name for the galeate curassow. See CURASSOW.

Cushing, kŭsh'ĭng, **Caleb,** American jurist and diplomatist: b. Salisbury, Mass., 17 Jan. 1800; d. Newburyport, Mass., 2 Jan. 1870. His intellectual abilities manifested themselves early. He entered Harvard College at 13 and was graduated in 1817. He then studied law, was admitted to the bar at 22 and soon acquired an extensive practice, standing with Rufus Choate (q.v.) at the head of the Essex bar. He was a member of Congress 1835–43, and in the last-named year having left the Whig party, was appointed by President Tyler United States commissioner to China. He was an enthusiastic supporter of the Mexican war, raising a regiment and accompanying it to Mexico, for which he was promoted to the rank of brigadier-general. He was attorney-general of the United States 1853–7, and was president of the Democratic Convention in Charleston, S. C., in April 1860. During the Civil War period he was several times employed on confidential missions by President Lincoln and the heads of departments, and in 1868 was sent to Bogotá to settle a diplomatic difficulty, which he did successfully. In 1860 he was member of a commission to revise and codify the laws of Congress; he was appointed counsel before the Geneva Arbitration Tribunal 1871–2; and was minister to Spain 1874–7. His legal decisions were distinguished both for sagacity and professional erudition. He filled a large place in the political history of his time, but the services which he performed for his country are scarcely remembered now. It should not be forgotten, however, that he negotiated the first American treaty with China, while as member of the Massachusetts legislature for several terms, and mayor of Newburyport, he did good service to his State and city. He published: 'Practical Principles of Political Economy' (1826); 'History of Newburyport' (1826); 'Historical and Political Review of the Late Revolution in France' (1833); 'Reminiscences of Spain' (1833); 'Growth and Territorial Progress of the United States' (1839); 'Life of William Henry Harrison' (1840).

Cushing, Frank Hamilton, American ethnologist: b. Northeast, Pa., 22 July 1857; d. Washington, D. C., 10 April, 1900. He became interested in Indian relics, and when 19 years old was made curator of the ethnological exhibit at the Centennial Exposition in Philadelphia. Accompanying Powell's New Mexico expedition, he settled among the Zuni Indians for the purpose of study. In 1881 he conducted excavations in Arizona, and in 1895 discovered archæological remains in Florida. In 1897 he became connected with the United States Bureau of Ethnology. Among his works are: 'The Nation of the Willows' (1882); 'My Adventures in Zuni' (1883); 'Manual Concepts' (1892); 'Zuni Folk Tales' (1902).

Cushing, Harry Alonzo, American educator: b. Lynn, Mass., 1870. He was graduated at Amherst College 1891, and took graduate studies at Columbia University 1894–6. He has published 'History of the Transition from Provincial to Commonwealth Government in Massachusetts' (1896). He is at present (1903) lecturer in history and constitutional law at Columbia.

Cushing, Luther Stearns, American lawyer: b. Lunenburg, Mass., 22 June 1803; d. Boston 22 June 1856. He was the only graduate of the Harvard Law School in 1826. He was clerk of the Massachusetts House of Representatives 1832–44, and reported the decisions of the State supreme court 1850–6, preparing 12 volumes of law reports for those years. He was lecturer on Roman law at the Harvard Law School 1848–56, but is best known for his 'Manual of Parliamentary Practice' (1844), which immediately became an authority in parliamentary assemblies throughout the English-speaking world, and remained so for half a century. Other of his works are: 'Treatise on Trustee Process' (1837); 'Treatise on Remedial Law' (1837); 'Reports of Controverted Election Cases in Massachusetts' (1852); 'Introduction to the Study of Roman Civil Law' (1854); 'Lex Parliamentaria Americana' (1856), and translations of several legal works from the French and German.

Cushing, Thomas, American statesman: b. Boston, Mass., 24 March 1725; d. there 28 Feb. 1788. He was graduated from Harvard 1744; was elected speaker of the Massachusetts Assembly 1766–74, and was a member of the first and second continental congresses 1774–5, being defeated for re-election because he opposed a declaration of independence. In 1783 he was lieutenant-governor of Massachusetts, and a member of the convention that ratified the Federal Constitution 1788. John Adams describes him as being exceedingly useful to the patriot leaders in obtaining valuable secret information. He was one of the founders of the American Academy of Arts and Sciences.

Cushing, William, American jurist: b. Scituate, Mass., 1 March 1732; d. there 13 Sept. 1810. He was graduated at Harvard in 1751, became judge of probate in Maine in 1768, judge of the Massachusetts superior court in 1772, and chief justice in 1777. Washington appointed him associate justice of the Supreme Court of the United States in 1789, and in 1796 offered him the post of chief justice, which he declined.

Cushing, William Barker, American naval officer: b. Delafield, Wis., 4 Nov. 1842; d. Washington, D. C., 17 Dec. 1874. He entered the navy as a volunteer officer in 1861, and was promoted to a lieutenancy in the following year. His greatest exploit performed was in October 1864. For some time previous nothing had been able to cope with the Confederate ram Albemarle. She had successfully encountered a strong fleet of Federal gunboats and fought for several hours without sustaining material damage. Cushing volunteered to destroy the ram, and on the night of 27 October accomplished the feat. For this he received the thanks of Congress, and was made a lieutenant-commander, becoming a commander in 1872. See PLYMOUTH, N. C., ENGAGEMENT AT.

Cushman, kŭsh'man, **Charlotte Saunders,** American actress: b. Boston 23 July 1816; d. there 18 Feb. 1876. She appeared first in opera in 1834, and as Lady Macbeth in 1835. Miss Cushman played sometimes in high comedy, but her name is identified with tragic parts. In 1844 she accompanied Macready on a tour through the northern States, and afterward appeared in London, where she was well received in a range of characters that included Lady Macbeth, Rosalind, Meg Merrilies, and Romeo —her sister Susan (1822–59) playing Juliet. In later years she acted with great success in many cities in the United States and was also prominent as a dramatic reader. She retired from the stage in 1875.

Cushman, Robert, American colonist: b. Kent County, England, about 1580; d. England 1625. He was one of the Pilgrims who accompanied John Carver to Leyden in Holland. In 1617 he and Carver went to London and endeavored to secure a charter to settle in America and enjoy the privilege of absolute freedom of worship. King James refused to grant this concession, but promised not to molest them in the event of their settling in America. In 1619 Cushman and Elder Brewster made another application, and this time the king granted the charter and promised toleration as long as they remained faithful subjects to him. In 1620 Carver and Cushman returned to London, collected funds, made purchases of provisions, and arranged for vessels to transport the Pilgrim colony at Leyden to America. The Speedwell was chartered and sent to Delfthaven to bring the colonists to Southampton, where the Mayflower was engaged to meet them. Cushman and his family embarked on the Speedwell 5 Aug. 1620, and on the 15th both ships set out from Southampton for America. On the 23d leaks in the Speedwell obliged them to put into Dartmouth; they started again on the 31st, but further misfortunes to the Speedwell obliged them to return to Plymouth, where she was abandoned, and 18 passengers, including Cushman, gave up the voyage. He remained in England as the colonists' financial agent and to forward supplies. In July 1621 he sailed for America with his son Thomas, in the ship Fortune, and arrived at New Plymouth 21 November. He sailed for England again 13 December 1621, was captured by the French, but released after a short imprisonment. In 1622 he published an eloquent vindication of the Plymouth colonial enterprise and appealed for missions to the Indians. In 1623, with Edward Winslow, he obtained from Lord Sheffield a grant of territory on Cape Ann and with a new band of devout colonists made the first permanent settlement within the limits of Massachusetts Bay colony. During his brief visit to the Plymouth settlement in December 1621, he preached a sermon on "The Sin and the Danger of Self-love," the first sermon delivered in America that was printed (London 1622). The original edition is of great rarity, only three copies being known to exist. The Charles Deane copy sold at auction in 1898 for $1,000. Reprints of it were published at Boston in 1724, 1780, 1870; at Plymouth 1788 and New York 1858.

Cusins, kŭz'ĭnz, SIR **William George,** English composer: b. London 1835; d. 1893. As a lad of 10 he sang in the Royal Chapel, and developing musical abilities, he was sent to Brussels, where he studied under the leading masters. He secured one of the most valuable scholarships in the Royal Academy of Music before he was 16 years of age, at which time he became organist to the queen. At the age of 32 he took charge of the Philharmonic Society, succeeding Sterndale Bennett, and took important part in the musical development of England, being knighted for such service in 1892. His works include a Concerto in A Minor; a cantata; Gideon, an oratorio; and a number of songs.

Cusk, kŭsk, a fish belonging to the cod family or *Gadidæ* and to the genus *Brosmius* (Cuvier), characterized by an elongated body, a single dorsal fin extending the whole length of the back, fleshy ventral fins, and one barbel at the chin. The American cusk, which is considered specifically distinct from the European, is the *B. flavescens* (Lesueur); its color varies from brownish with yellowish sides to whitish with brownish patches, and the immature fish is of a uniform dark slate color, sometimes with transverse yellow bands; the dorsal, caudal, and anal fins are bordered with bluish black, and edged with white; the dorsal and anal are continued to the base of the tail. The length of the fish varies from two to three feet or more, a small one weighing about four pounds; it is taken generally on the middle bank, with the hook, by the deep water cod-fishers. In the spring it is seen in Boston market, when it is less esteemed than cod, but in the winter it commands a higher price; as a fresh fish it is considered a delicacy, and salted is generally preferred to cod. It is found along the shore of the British provinces, and even to high latitudes. The European species, *B. vulgaris* (Cuvier), called torsk or tusk, is also a northern fish, occurring plentifully among the Shetland Islands, where it forms a considerable article of trade; it is caught, salted, and dried in the same manner as cod; it is common on the coasts of Norway, Iceland, and the Faroe islands. It resembles very much the *B. flavescens*, and the two are considered by some as varieties of one species.

Cuspa'ria Bark, the bark of the *Galipea Cusparia*, and some other species, also called Angostura bark (q.v.).

Cusso, cŭs'ō, a small Abyssinian tree of the rose family (Rosaceæ), having alternate pinnate leaves and dicœcious flowers, which are imported into Europe and used as an anthelmintic.

Cust, kŭst, **Arthur Perceval Purrey,** English clergyman: b. 1828. He was educated at Brasenose College, Oxford, studied for the Anglican priesthood, was curate of North Church, Hertfordshire 1851–3; rector of Cheddington 1853–62; vicar of St. Mary's, Reading 1862–75; vicar of Aylesbury 1875–0; archdeacon of Buckingham 1875–80; and dean of York from 1880. He has published: 'The Heraldry of York Minster' (1900–6); 'Picturesque Old York' (1896); 'York Minster' (1897.)

Cust, Lionel, English art writer: b. London 25 Jan. 1859. He is the eldest son of Sir Reginald Cust (q.v.) and was educated at Eton and Trinity College, Cambridge. Since 1895 he has been director of the National Portrait Gallery. Among his published works are: 'Artists Represented in Department of Prints and Drawings in British Museum' (1893–6); 'Albrecht Durer: a Study of his Life and Art' (1897); 'History of the Society of Dilettanti' (1898); 'The Master "E. S." and the "Ars Moriendi"' (1898); 'History of Eton College' (1899); 'Sir Anthony Van Dyck' (1900); 'Van Dyck's "Chatsworth" Sketch Book' (1901).

Cust, Sir Reginald John, English writer: b. Shavington Hall, Shropshire, 25 Sept. 1828. He was educated at Eton, and Trinity College, Cambridge, and was assistant commissioner West Indian Encumbered Estates Court 1895–87, and chief commissioner 1887–92. He has published: 'Treatise on West Indian Encumbered Estates Acts' (1859); 'Marriage with a Deceased Wife's Sister Historically Considered' (1888); 'Early Poems' (1892). He was knighted in 1890.

Custard-apple, a common East Indian name for the fruit of certain species of the *Anonaceæ*, some of them the most delicious of the tropical fruits. The common custard-apple (*A. squamosa*), a native of tropical America, is a large greenish or dark-brown fruit. The tree grows to considerable size. The alligator-pear, sour-sop, and sweet-sop are members of the family. The chief North American representative is the papaw (*Asimina triloba*). This tree grows to a height of 45 feet in favorable locations, the stem being sometimes 10 inches in diameter. The wood is soft, light, and weak, weighing about 24 pounds to the cubic foot. The fruit is a fleshy berry, three to seven inches long, sweet, and edible when ripe, in October. The tree grows along streams from Ontario, through western New York and New Jersey near Pennsylvania, south to Florida and west to Texas and Michigan.

Custer, Elizabeth Bacon, American writer: b. Monroe, Mich., about 1844. In February 1864 she was married to George A. Custer (q.v.). She is author of 'Boots and Saddles, or Life in Dakota with General Custer' (1885); 'Tenting on the Plains, or General Custer in Kansas and Texas' (1887); 'Following the Guidon'; etc.

Custer, George Armstrong, American general: b. New Rumley, Ohio, 5 Dec. 1839; d. 25 June 1876. A West Pointer, graduating June 1861, his first day at the front was at Bull Run, on Kearny's staff; he then went on W. F. Smith's, in charge of balloon reconnaissances; then, for daring courage and endurance, was appointed on McClellan's, and captured the first colors taken by the Army of the Potomac. In 1863 he went on Pleasonton's staff; shortly after, for dashing gallantry, was appointed brigadier-general of volunteers, commanding a Michigan cavalry brigade. He made it famous, and foiled Stuart at Gettysburg, for which he was brevetted major in the regular army. In 1864 his brigade was assigned to Sheridan's corps, and he was noted as one of the most brilliant officers in the Virginia campaigns, winning steady promotions; brevet lieutenant-colonel for Yellow Tavern, brevet colonel for Winchester. On 9 October, in command of the Third Division, he won the splendid victory of Woodstock; on the 19th, at Cedar Creek, he contributed largely to the Confederate defeat made permanently familiar by "Sheridan's Ride," and was brevetted major-general of volunteers. In the spring of 1865 his division by itself won the battle of Waynesboro, capturing 1,600 prisoners and 11 guns; and followed it up by annihilating Early's command, and capturing all the rest of his artillery and his baggage. He fought at Five Forks and Dinwiddie Court-House, and was brevetted brigadier-general United States Army. After the surrender at Appomattox he was brevetted major-general United States Army, and appointed major-general of volunteers. Assigned to duty in Texas, then appointed chief of cavalry till mustered out of the volunteer service, he asked permission to accept Juarez's offer of the chief command of Mexican cavalry against Maximilian; refused leave of absence, he took the lieutenancy of the Seventh cavalry, and joined it at Fort Riley, Kan., November 1866, under Hancock, who was succeeded by Sheridan in the summer of 1867. Custer shortly after saw his first Indian service; and closed a campaign against the Cheyennes in 1868 by the crushing victory of the Washita (q.v.), where 103 Indian warriors were killed, and the tribe forced to return to their reservation. He was stationed in Kentucky 1871–3. In the spring of 1873 he was sent to Dakota to make head against an Indian insurrection of the first order, organized by Sitting Bull and Crazy Horse, and comprising not only the Sioux but a mass of other tribes in Dakota, Montana, Wyoming, etc. He fought a number of battles, and opened up the Black Hills country. In the spring of 1876 Sheridan made ready for a decisive blow, sending three divisions under Crook, Terry, and Gibbon to unite and crush Sitting Bull on the Yellowstone. Terry and Gibbon united without discovering the Indian army; Crook beat up Crazy Horse's band, and after a sharp skirmish the whole Indian force of 5,000 or 6,000 moved to the Little Big Horn. They were discovered by Terry's scouts, and Terry sent Custer in advance, with his cavalry regiment of 600 men in 11 companies, to bar their escape east; he was to wait for the main body at the junction of the Big Horn and Little Big Horn 26 June. Custer arrived there the night of the 24th; his scouts discovered the Indian village the next morning; from imperfect information he supposed that they were only the 1,200 or 1,500 Pawnees he had known were marching to join Sitting Bull, and he resolved to surround and capture them all. The Indians were on a ridge west of the Little Big Horn; Custer kept five companies, 260 men in all, for a direct attack on the centre, gave four to Major Reno to assail their left (south), and two to Capt. Benteen to make a southern detour of two miles

and come on their right rear, cutting off their retreat. The Indians had broken up their tents and were about to retreat, when they discovered how weak was the assailing force. The three divisions forded the river, and Custer rode for the heart of the Indian line. A rise across the stream masked the enemy, many hundreds of whom lay in a ravine between it and the higher ridge beyond; and as Custer swept down, the savages rode against him and swarmed around to his rear. Outnumbered 20 to 1, the heroic band still fought their way up to the ridge, and a small number with their general reached it; then a fresh band of 1,000 Cheyennes rose up, under Rain-in-the-Face, and not a soul was left alive. Meantime Reno had been repulsed and had taken refuge across the creek; and Benteen never reached the neighborhood of the fight; but rejoined Reno at a bluff on the east, where they held the Indians at bay till Terry arrived next morning. The bodies of the slain division were left as they lay, all horribly mutilated, except Custer's. Forty-two Indians were killed. The battlefield has been marked with a small marble monument where each man fell. Custer wrote 'My Life on the Plains' (1874). His life has been written by Whittaker (1876), and by the general's wife, Elizabeth B. Custer.

Custer Massacre. See CUSTER, GEORGE ARMSTRONG.

Custine, küs-tēn', **Astolphe,** MARQUIS DE, French novelist and writer of travels: b. Niederwiller, Meurthe, France, 18 March 1790; d. near Pau, France, 29 Sept. 1857. He traveled in the British Isles, Switzerland, and southern Italy (1811–22), and afterward in Spain and Russia. He published: 'Mémoires et Voyages' (1830); 'La Russie en 1839' (1843); a tragedy, 'Beatrice Cenci'; and some romances, among them 'Aloysius, or the Monk of St. Bernard'; 'Romuald, or the Vocation.' His 'Letters to Varnhagen von Ense and Rachel Varnhagen von Ense' appeared in 1870.

Custis, George Washington Parke, American writer: b. Mount Airy, Md., 30 April 1781; d. Arlington House, Fairfax County, Va., 10 Oct. 1857. He was the adopted son of George Washington, and wrote 'Recollections of George Washington,' and several plays and orations.

Custom, such a usage as by common consent and uniform practice has become the law of the place or of the subject-matter to which it has relation. General customs are such as constitute a part of the common law and extend to the whole country, while particular customs are those which are confined to a particular district. As a rule, when a contract is made in relation to another, about which there is a well established custom, it is presumed that such custom forms part of the contract and may be always referred to for the purpose of showing the intention of the parties in all those particulars which are not expressed in the contract. If, however, the meaning of the contract is certain and beyond doubt, no evidence of usage will be admitted to vary or contradict it. In order to give validity to a custom it must be certain, reasonable in itself, commencing from time immemorial, and continued without interruption. And a custom which is unreasonable, uncertain, and which savors too much of arbitrary power, is void; consequently where a custom is opposed to a well-settled rule of law, and is calculated and intended to violate such law, the custom will not be allowed to have any effect. The true office of a usage or custom with respect to contracts is to interpret the otherwise indeterminate intention of parties, and to ascertain the nature and extent of their engagements arising not from their express stipulation, but from mere implications and presumptions and acts of a doubtful or equivocal character, or to ascertain the true meaning of words in an instrument where those words have various senses; and custom or usage is sometimes admissible to add new terms not expressed in or covered by the writing.

Custom-house, an establishment where commodities are entered for importation or exportation; where duties, bounties, or drawbacks, payable or receivable upon such importation or exportation, are paid or received, and where ships are entered and cleared. The principal custom-house of the United States is in New York. See NEW YORK CUSTOM-HOUSE.

Customary Law. A usage cannot be sustained in opposition to well established principles of law. To sustain a usage under such circumstances would be extremely pernicious in its consequences, and would render vague and uncertain all the rules of law. A mere custom or usage is therefore without force in opposition to a positive law. Thus a usage for factors to pledge the goods of their principals is void, being against a general rule of law. So the usage for a master of a vessel to sell the cargo without necessity when the vessel is stranded; so of a custom, different from the law in a certain place, to re-enter for a forfeiture incurred by the non-payment of rent. And it is held that the custom and understanding of the merchants in a particular trade cannot be admitted to prove that the barter or exchange of a promissory note, indorsed without recourse, for cotton or any other species of merchandise, carries with it no implied warranty of the past or future solvency of the maker of the note. So where a transaction is within the statute against usury, the usage of trade as to such transaction cannot be received in evidence to show that it is not usurious. Known and settled usages, however, should be respected by courts and juries, unless such usages are against the laws or policy of the country. Usage is evidence of the construction given to the law, and when it is established and uniform it regulates the acts and duties of those who act within its limits. Usage is a matter of fact, and not of opinion. A usage of trade must therefore be proved by instances, and cannot be supported by evidence of opinion merely. It is proved by witnesses testifying of its existence and uniformity from their knowledge obtained by observation of what is practised by themselves and others in the trade to which it relates.

Customs Duties (customary taxes; in the constitutional struggles of mediæval England, so claimed by the sovereigns as of ancient usage and allowance), taxes on the exports and imports of a State or district. Apparently, they were at first port fees for the use of the government quays, warehouses, weights and measures, etc.; but in very ancient times they

became a general source of revenue, and used for sumptuary purposes. The constitutional prohibition of export duties leaves it applicable in the United States to imports alone. In countries of developed commerce these have always been the favorite means of taxation with governments and subjects alike, by a rare and significant harmony. The latter prefer them to direct taxes, as distributing the burden in small unperceived amounts on their daily income, in place of a few severe annual exactions. The former prefer them as making it possible not only to raise a far greater revenue with far less criticism, but actually to win popularity by increasing the burden, in most countries—a unique feature in administrative policy. Direct taxes have been the fertile parent of rebellions; customs duties have generally been popular in proportion to their magnitude. The latter fact is due to two other traits inherent in import taxes; that they furnish an apparent means of transferring the tax burden largely to the foreign producers, and of giving the native producer the monopoly of the "home market." It is obvious that the two are more or less self-contradictory—that the foreigner can share the payment only in proportion to his share of the market, and that if imports were annihilated all taxes would be direct; but the discussion of this subject belongs to the question of protective tariffs (see PROTECTION). Here it need only be said that it is not necessary for dutiable articles to be such as are produced within a country, for a tax to be "protective" in action: they may be high-grade articles needed in manufacturing, the charge upon which forces a resort to inferior native materials, or increases the price of the better goods. This increase is always much greater than the duty, as it includes interest on the extra capital needed to carry on business with the costlier articles, and a further charge for the restricted market due to heightened price.

Customs duties must belong to one of two classes: those charged on given units of weight or measure, as the pound, ton, yard, gallon, etc., called specific duties; and those charged by a percentage on the estimated value, called ad valorem duties. On many kinds of goods the two are combined in what are called compound duties; and a variant of the ad valorem system is what is called the minimum duty, under which all goods costing less than a certain sum are assumed to have cost that amount and are taxed upon it. In the old English disputes between king and Parliament specific duties were called "tonnage" (so much per ton); and ad valorem duties "poundage" (so much per cent on the estimated value in pounds sterling), though levied so as not to be purely ad valorem.

The merits of the two systems are not unanimously agreed upon; indeed, each has its special demerits and disadvantages, which are grave from the standpoint of national welfare. It is fair to say, however, that most of the difficulty of the specific duty lies in the attempt to use it for protective purposes, and that of the ad valorem duty in its enormous volume; that a specific duty for revenue only loses most of its objectionable features if levied on the proper articles, and that a low ad valorem duty would be free from most of the objections of a high one. This will be evident from a glance at each.

Specific duties are simple to calculate, easy to collect, do not require a high grade of official skill, and leave few loopholes for fraud. The great drawback is, that they produce immense inequality of duty from the variation in cost and quality, and that inequality in exactly the wrong direction. That is, a certain number of cents on a pound or yard of cheap material may be very high or even prohibitory, while on expensive material the same may be trivial. Now, if the goods are articles of direct consumption, this places nearly all the burden, or an entire deprivation of use, on the poor, and relieves the rich; if they are raw materials of manufacture, it acts as a bounty on the manufacture of coarser and cheaper goods at the expense of the better qualities, turns capital and labor in that direction, and makes it the interest of manufacturers to produce the cheapest goods possible to sell. On the other hand, if the duties are placed on articles not produced or manufactured in the country, while it will still favor the rich against the poor, at least the internal industries are not demoralized; and by restricting them to very few articles, and those without immense variation in price, the English government avoids the greater part of the former evil. Its duties are collected entirely from 20 articles; one of them, on coal, is an export duty. An objection to specific duties on the part of revenue reformers is, that it enables the government to deceive the people as to the amount they are taxed. These duties have always been the favorites of protectionists, the ad valorem duties being preferred by the revenue-tariff leaders; the United States duties are compound.

The ad valorem duty, theoretically the fairest of all, is full of practical difficulties as a revenue producer, and highly unsatisfactory as a protective system. In the former line, the difficulties of fixing the value, the opportunities for fraud and undervaluation, the temptation to officials to connive, and the expensive skilled officials needed to work it, all stand in the way of its usefulness to the government. The value is usually fixed at the point of export; but that involves minute knowledge by the official of a vast number of trades and manufactures, and the fluctuations of trade conditions; and moreover, the market may have changed materially from the time the duty is assessed to the time the importer pays it, which shifts the burden from the government to the merchant. Furthermore, the plenary powers assumed by the government to throw all the burden of doubt on the importer, to seize his goods on suspicion and confiscate them on proof satisfactory to itself, but not to him, though partially remediable by the courts, and very likely necessary to secure the government, place the importer in a situation by no means free from thorns. And the tedious, costly, and vexatious red tape of invoicing and appraising and satisfaction of legal forms, are bad at best even if necessary; and when reenforced by the zeal of officials anxious to win laurels by harassing importers, and desirous of throwing difficulties in the way of even legitimate trade, make it impossible for small capitalists to bear the risks. Thus the small merchant is driven out of the business and the trade concentrated in a few great houses. But a low duty would take away most of the temptation and most of the need for highly paid officials, and would make it practicable to utilize a much simpler system. As a protective system the drawback is, that the duty falls exactly when

the cheapness of foreign goods, and their consequent liability to compete, make it desirable to raise it. Here, too, the low revenue duty would make the change less serious.

The customs receipts of the United States in 1902 were $254,444,709, as against $308,033,524 from all other sources. This is on the whole a great decline in the ratio of customs to other receipts; the former from the foundation of the government to 1880 had exceeded the latter by about one third, and in 1890 stood $229,668,585 to $173,412,398. In some later years, however, the proportion has been even lower than last year: notably 1898, when it was $149,819,594 to $255,501,741.

Custozza, koos-tōt'zä, Italy, a village in the province of Verona, about 10 miles southwest of the city of Verona. It is noted as being the place where the Italians were twice defeated by the Austrians.

Cut-worm, the caterpillar of an owlet moth of the tribe of *Noctuæ*, and group *Agrotididæ;* and, loosely, many other grubs and worms living in the ground. It stays by day about the roots of plants, and comes forth at night to cut off their tender stems and leaves. Some of the moths fly by day, others only at night; the wings are nearly horizontal when closed; the thorax smooth and slightly convex; the antennæ of the males generally with two rows of tooth-like points on the under side; the fore legs are often spiny. The caterpillars are smooth, shining, naked, dark-colored, with longitudinal pale and dark stripes, and a few black dots on each ring; cylindrical, short, and thick, with 16 legs; the chrysalis is transformed in the ground, without a cocoon. They destroy whole fields of vegetables, and also asters, balsams, and other ornamental plants. The caterpillars vary in length from one to two inches, and are dark ashy gray, with brown head, and a pale dorsal stripe, with minute black dots; the chrysalis is a shining dark brown, and the moth appears from 20 July to the middle of August. The largest is the *A. telifera*, having the fore wings light brown, divided by two transverse bands of wavy dark brown lines, and with three spots (one lance-marked) encircled with dark brown; the hind wings are pearly white, the abdomen gray; expanse of wings at least two inches. The *A. inermis* is slightly smaller; the thorax is reddish brown. The *A. messoria* has the fore wings reddish gray, with five wavy blackish bands and three wing spots; the hind wings whitish, and dusky brown behind; the body grayish; the expanse of wings one and two fifths inches. The *A. tessellata* expands only one and a quarter inches; the fore wings are dark ash, with only a faint trace of bands, and with large alternate pale and black spots; the hind wings brownish gray in the middle, and blackish behind. The *A. devastator*, the moth of the cabbage cut-worm, has the fore wings dark satiny ashy gray, with four wavy, whitish bands edged with black, and white dots and dark spots; the hind wings are a light brownish gray, dusky behind; body gray; expanse of wings one and a half to one and three quarter inches. The only effectual way to prevent their depredations is to open the earth daily at the foot of the growing plants and kill the worms, which are easily found. It is said that a manure of sea mud will protect a garden from these worms; some cultivators protect their cabbage plants by wrapping a walnut leaf or paper cone firmly around the root, secured by an earth embankment.

Cutch, kŭch, India, a principality controlled by Bombay, lying to the south of Sind, area, 6,500 square miles. During the rainy season it is wholly insulated by water, the vast salt morass of the Rann separating it on the north and east from Sind and the Guicowar's dominions. Pop. (1902) 542,612.

Cutch, Gulf of, an inlet of the Arabian Sea, extending into the west coast of India about 100 miles, and forming an outlet for the salt marshes of Cutch in India.

Cutch Gundava, gŭn-dä'vä, Baluchistan, a division occupying a northeast projection, in a great measure separated from the rest of the country by the mountain range of Hala; area, 10,000 square miles. Pop. 120,000.

Cuthbert Bede. See BRADLEY, EDWARD.

Cuthbert, Saint, English anchoret, cenobite, and bishop: b. about 633; d. Farne, Northumbria, 20 March 687. He is one of the three most eminent saints of the Church in England, the other two being Saint Edmund of Edmundsbury, and Saint Thomas à Becket, archbishop of Canterbury. The time and place, and even the country of his birth are unknown, but the most trustworthy historians say he lived from 635 to 687. In his youth he entered the monastery of Melrose (the first Melrose), at that time within the limits of Northumbria, and after making his religious profession there, was successively prior of that abbey, prior of Lindisfarne, bishop of Hexham, and bishop of Lindisfarne, with intervals in which he withdrew from conversation with all men and lived a recluse hermit on the island of Farne. The fame of his sanctity, religious zeal, and miracles was great in his lifetime; but grew steadily greater after his death, and many churches in England were dedicated to him. His body was found incorrupt when his tomb was opened 11 years after burial. When Norse corsairs threatened Lindisfarne in 875, the monks of Lindisfarne bore the precious remains away to a place of safety inland, and for a time the body had no fixed resting place until it was deposited at Durham, where, enclosed in a splendid shrine, it remained till the Reformation, an object of veneration and the instrument of incessant miracles.

At the Reformation the shrine, with its costly ornamentation, went to increase the king's treasure, and the body of Cuthbert was buried under the pavement of the Durham Cathedral. The coffin was lifted in 1827 and the body, or rather the skeleton, of the saint, was found wrapped in five robes of embroidered silk; there were three coffins, one within another, namely, an outermost one, made in 1541, within that another, believed to date from 1104, and then the *cista*, in which the relics were deposited when the body was disinterred in 698. His feast is observed on 20 March.

Cuthbert, Ga., the county-seat of Randolph County, on the Central of Georgia Railroad. The town is the trading centre of a fruit-growing and cotton-raising region, and has colleges for men and women. Pop. (1900) 2,641.

Cuticle (Lat. *cuticula*, diminutive of *cutis*, "skin"), a thin, white, pellucid, insensible membrane, covering and protecting the true skin,

with which it is connected by the hairs, exhaling and inhaling vessels, and the *rete mucosum*. See SKIN.

Cutlass (Fr. *coutelas*, "small knife" or "sword"), a short sword used by seamen. The art of fencing with it is different from that with the small sword or broad sword. A guard over the hand is an advantage. It is a very effectual weapon in close contest; on account of its shortness it can be handled easily, and yet is long enough for defense.

Cutlass-fish. See SCABBARD-FISH, or SWORD-FISH.

Cutler, Arthur Hamilton, American educator: b. Holliston, Mass., 26 Jan. 1849. He was graduated at Harvard 1870; spent a few years in business, and in 1876 organized the Cutler School in New York, one of the leading preparatory schools in the United States, which has sent over 300 of its graduates to Harvard, Yale, Columbia, Princeton, and other colleges.

Cutler, Elbridge Jefferson, American educator: b. Holliston, Mass., 28 Dec. 1831; d. Cambridge, Mass., 27 Dec. 1870. He was professor of modern languages at Harvard 1865–70, and widely known as an able and generous literary critic. He published: 'War Poems' (1867); 'Stella' (1868). Consult 'Memoir' by A. P. Peabody (1872).

Cutler, Henry Stephen, American musician: b. Boston, Mass., 7 Oct. 1824; d. Swampscott, Mass., 5 Dec. 1902. He was organist of Trinity Church, New York, 1860–98, and on the occasion of the visit of the Prince of Wales to New York in 1860 the men and boys of Trinity choir were vested for the first time. From this incident the custom of vesting choirs in American Episcopal churches appears to have been originated. Cutler was the author of many musical compositions, and his arrangement of the hymn, 'The Son of God Goes Forth to War,' is widely known.

Cutler, Manasseh, American Congregational clergyman: b. Killingly, Conn., 3 May 1742; d. Hamilton, Mass., 28 July 1823. He was graduated at Yale in 1765, became a lawyer in 1767, and Congregational minister in 1771, and a chaplain in the Revolutionary army in 1776. After the war he helped form the Ohio Company, which settled Marietta in 1788, and had a leading part also in the formation of the State of Ohio, being credited with drafting the noted "Ordinance" of 1787. He was a member of Congress from Massachusetts 1800–5. He was also a botanist of distinction, describing 350 species of plants native to New England. Consult 'Life, Journals, and Correspondence of Manasseh Cutler' (1888).

Cutler, Timothy, American clergyman: b. Charlestown, Mass., 1683; d. Boston August 1765. He was graduated at Harvard in 1701; was a Congregational pastor at Stamford, Conn., 1710–19, when he became rector of Yale College. In 1722, convinced of the non-validity of Congregational ordination, he became a believer in episcopacy, and was dismissed by the trustees of Yale. Going to England, he was ordained by the Bishop of Norwich in 1723, was appointed a missionary of the Society for the Propagation of the Gospel, and taking charge of Christ Church, Boston, Mass., 1723, remained its rector until his death. He was throughout his later life one of the most influential of the colonial clergy.

Cutlery, cutting instruments of all kinds, made of steel. In earlier ages of man's history, and among savage nations whose civilization represents that of prehistoric man, sharp-edged implements were made of stone, shells, or bone. The Egyptians had a process for rendering bronze as hard as our steel. The Greeks were early acquainted with the properties of steel, and the Romans also knew this metal to a greater or lesser extent. Yet in Italy, to judge from the swords and surgical instruments discovered at Pompeii and Herculaneum, bronze continued to be the cutlery metal during the early Christian era. In later times Damascus, Toledo, and Ferrara were noted for the manufacture of sword-blades. Sheffield was renowned for cutlery in the days of Chaucer, and now the cutlery of the United States may justly claim to be as choice in design and as fine in temper as any in the world.

The process of modern cutlery manufacture is a long and interesting one. The manufacture of pocket knives, table knives, razors, and surgical instruments may justly claim to belong to the scientific arts. In the Old World the journeyman cutler must have served an apprenticeship of seven years. Even such a long training does not always make a skilful workman, and a cutler is always considered to be at his best between his 40th and 45th years. There are five distinct branches engaged in the production of a common penknife, namely, those of material making, blade-forging, blade-grinding, cutling, and blade-finishing. Then there are the minor industries of whetting, handle-cutting, hardening, and tempering, which demand considerable skill on the part of the operative. The several processes in the manufacture of a pocket knife include forging the blade, stamping the name on it, tempering, and hardening it, grinding, and assembling it, that is, putting it together. It then goes to the blade-finisher, and is inspected. After being whetted, it is again inspected. Finally it is cleaned and packed, after being inspected for the last time.

The best quality of steel must be employed in the making of good cutlery. For a four-blade knife from three to three and one quarter inches are forged from rod steel. Three heats and three operations are necessary to make one blade and an ordinary workman will forge about 18 dozen in one day.

Blades made from the best of steel are heated at low heat of a cherry red lustre to harden. They should be white when coming out of the water and readily show the color of the temper, without brightening when laid on a copper plate back down on a slow fire. A purple color is acknowledged by the most competent judges, to be the proper color of a true temper.

It is most important that the fire used in tempering should be free from gases and sulphur, the water in which the blade is plunged, clean and soft. Then follows the grinding. Blades in this country are ground on a Lake Huron stone; these stones are kept in order by the constant use of a nail-rod, commonly known as a racing-iron, to keep the edges of the stone sharp and open the surface pores which may have become clogged from grinding many blades.

What is called cutling consists of drilling, filing, fitting, polishing, assembling, and buffing.

A material maker takes the brass, german-silver, and steel from the sheet and works it up into what is known by the craft as scales and springs. Springs are pressed out in their proper shape. Bolsters are pressed, stamped and riveted on a brass lining and pressed through dies, according to the shape of the knife desired.

Blade-finishing is done on wheels of wood covered with emery-coated leather. The highest polish is obtained from crocus, oxide of iron, on wheels run at very slow speed, that is, with not more than 150 to 200 revolutions per minute. The crocus polishing powder is applied to the wheel by a piece of French felt. The same material is also used in pressing the work on the wheel.

Whetting is done on soft Arkansas stones, kerosene being used as a medium to keep the stone from gumming or clogging. In whetting a knife, the blade should not be laid flat, but should be held at an angle of from 25 to 35 degrees. When thus whetted it will have a white bevel on each side known to the profession as a "cannel."

Razors are made by very much the same process, excepting that the finest razor blades are tempered in fire regulated by a thermometer, so that absolutely the same temper can be given to each blade. In making a razor blade, only the very finest quality of steel can be used, as a very fine edge is required. It is not so with a carver. For a carver, double shear steel is better, as it readily takes the serrated edge which is absolutely necessary in cutting anything that has a partially yielding substance to divide. In a carver the proper degree of softness as well as hardness is needed. If the blade is too hard you cannot sharpen it on the steel which is absolutely necessary with a carver. A professional carver seldom or never cuts more than one slice of meat without putting his carver on the steel. The same rule applies to butchers' knives. It must not be presumed from this that a carver blade must be absolutely soft. If it is too soft it is useless.

Scissors and nail nippers of the better qualities are all hand-made. It is one of the axioms of a scissor maker that only the man who makes the scissors can tell what it cost or how much labor has been put in it, for the reason the more labor that is put in a scissor the better it will work and cut. The very best steel may be used, and if the scissor is not properly made, it will become useless in a very short time.

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Cutlips, one of the common names of the fish, *Lagochila lacera*, found in some of the rivers of the Mississippi Valley. The peculiar formation of its lower lip, which is divided into two parts, suggests the other common names it bears: splitmouth, harelip, and rabbit-mouth.

Cuttack, kŭt-tăk', India. 1. An executive district in the lieutenant-governorship of Bengal, province of Orissa; area 3,633 square miles. On the coast is extensively manufactured the best and whitest salt made in India. Pop. 1,937,671. 2. The capital of the district of Cuttack, on the Mahanadi River, 220 miles south of Calcutta, is chiefly noted for filigree-work in gold and silver. Pop. about 50,000. 3. The Cuttack Mehals are subject to 21 rajahs, tributary to Great Britain, and have an area of 14,387 square miles. Pop. 1,696,710.

Cuttage, the propagation of plants by means of slips or cuttings which are detached parts of roots, stems, leaves, etc. This form of asexual or bud-propagation is found in nature among willows, poplars, and many other trees and shrubs, especially such as are readily broken by wind and drop their twigs and branches into streams and ponds with muddy shores. Artificially, it is one of the oldest methods known and is of wide importance, ranking with graftage (q.v.) and seedage. The advantages of cuttage are that, with the rare exceptions due to bud variation, plants may be propagated true to variety or species in very great number, and the cost of production of the kinds commonly so propagated is small when compared with certain other methods such as division and layerage, in which cases roots are developed before the removal of the parts which become new individuals. An idea of the scope of this practice may be obtained from the fact that, except in the production of new varieties which are obtained by means of seeds, the great majority of florists' perennial plants such as roses, carnations, violets, chrysanthemums, are so obtained, as are also many fruit plants such as gooseberries, currants, grapes, and pineapples, though in the last instance other methods are also used to a large extent.

The methods for making the cuttings "strike" root are very various. Some species such as currant and gooseberry will soon produce roots if plunged in moist soil out of doors; others must be grown under glass, often with extra degrees of heat in the soil (bottom heat), in propagating boxes (glass-covered frames upon the greenhouse benches), and other devices, as well as specially favorable soils, etc. The methods of making the cuttings also differ widely with the species of plant and the part used, as the following classification will show:

CUTTINGS.

Roots or Rootstocks	Stem	Leaf
Short, under glass, Dracæna.	Growing wood, Soft-Fuchsia. Hard-Rubber plant.	Entire, laid flat on surface, Begonia.
Long, in open air, Blackberry.	Ripened wood, Long, in open air, Currant.	Divided, Begonia Rex.
By tuber cuttings, Potatoes.	Short, under glass, Yew.	Bulb Scales, Lily.

Consult: Fuller, 'The Propagation of Plants' (New York 1887); Bailey, 'The Nursery-Book' (New York 1896); id. article "Cuttage"; 'Cyclopædia of American Horticulture' (New York 1900–2).

Cutter, Charles Ammi, American librarian: b. Boston, Mass., 14 March 1837; d. Walpole, N. H., 7 Sept. 1903. He was graduated at Harvard in 1855, and from its Divinity School 1859. He was assistant in the Harvard Library 1861-8; librarian of the Boston Athenæum 1869–93; and of the Forbes Library, Northampton, Mass., since 1894. He has devised and published an admirable system of classification for books, known as the 'Expansive Classification' which has been adopted by many libraries, especially

[illegible] of college and learned institutions. He [illegible] the 'Library Journal' 1881–03, and has [illegible] Rules for a Printed Dictionary Catalogue' (1876; 3d ed. 1891), and prepared the 'Catalogue of the Library of the Boston Athenæum' (5 vols., 1874–82).

Cutter, Ephraim, American physician: b. Woburn, Mass., 1 Sept. 1832. He was graduated at Yale University in 1852; practised medicine in his native city till 1875, in Cambridge and Boston till 1881, when he removed to New York and began practice there. He has invented a large number of surgical instruments; contributed over 400 articles to literature on scientific subjects, including microscopic medicine, gynæcology, chronic diseases, and general medicine; and became a member of the Massachusetts Medical Society in 1856, and of the American Medical Association in 1871.

Cutter, George Washington, American poet: b. Massachusetts 1801; d. Washington, D. C., 24 Dec. 1865. He practised law in Kentucky until 1845; served as a captain in the Mexican war; became active in politics, and received a treasury clerkship. His poems are nearly all included in 'Buena Vista, and Other Poems' (1848); 'Song of Steam, and Other Poems' (1857); 'Poems, National and Patriotic' (1857).

Cutter, a name given to two kinds of small vessels. The first is one of the supplementary small-boats of a man-of-war equipped for both rowing and sailing. The cutters used by yachtsmen and by pilots, and revenue cutters are built with especial reference to speed, and have a single mast, and a "single-stick" straight-running bowsprit that may be housed in-board in dirty weather. They are much like the sloop in rig. The hull of the cutter is very deep and narrow, being almost V-shaped, with an almost perpendicular rise from the floor to the bulwarks, and a keel heavily loaded with lead. In heavy weather, working to windward, the cutter shows to best advantage. (See YACHTING.) A light sleigh with a single seat is called a cutter in some parts of the country.

Cutting, a detached part of a plant used for propagation.

Cuttle, Captain, a character in Dickens' 'Dombey and Son.' He is a retired merchant-captain with a hook in place of a right hand. He received and cared for Florence Dombey.

Cuttle-bone, the dorsal plate of *Sepia officinalis*, formerly employed in medicine as an absorbent, but now used for polishing wood, painting, varnishing, etc., as also for pounce and tooth-powder.

Cuttlefish, a common name for the Cephalopods, but originally applied to a member of the genus *Sepia*. In the United States it is restricted to the octopods (q.v.). The cuttlefish proper, *S. officinalis*, measures from 6 to 10 inches in length, and its color varies from pale-gray to dark-brown or neutral tints. The body is oval, flattened from above downward, and contained in a tough muscular sac (mantle), which expands along the whole of either margin into a narrow fin. The integument consists of a single layer of cells, lying upon connective tissue, in which are imbedded "chromatophores," or cells charged with various colored pigment-granules. By expansion of the cell the pigment is diffused, and by its contraction concentrated, hence the rapid flashes of changing color for which the *Cephalopoda* as a whole are so remarkable.

The head is broad, with a complex cartilage which protects the central nervous system, and a bright green eye. The front of the head is occupied entirely by the mouth, and the bases of the arms, of which there are 10, 8 having suckers on the extremity in 4 longitudinal rows. The two remaining arms, known as "tentacles," occupy the interspaces between the ventral arms and those next to them. They are twice as long as the others, and can be withdrawn into pockets situated beneath the eyes and carried in this position when not in use. The mouth, situated in the centre of the roots of the arms, is surrounded by a lip with seven prominent angles, which bear small suckers in some species.

On the lower side, between the muscular sac and the body proper which contains the viscera, is a hollow space, the "branchial" or "mantle-cavity," containing the siphon, the intestines, kidneys, genital organs, and gills. Respiration is carried on by rhythmic contractions of the mantle, in consequence of which water enters at either side, passes over the gills, and is expelled by the siphon; this takes place about 70 times in a minute. On the dorsal side of the animal, immediately beneath the integument, is a closed sac which contains the cuttle-bone. Speaking generally, this may be said to be of an elongated spoon or boat shape; it consists of a horny lamina. Lying parallel to the terminal portion of the intestine is the "ink-bag," a hollow gland opening near the anus, and furnishing a deep-brown fluid, which is ejected by the animal when alarmed in order to conceal its retreat. The pigment known as "sepia" is prepared from it. The heart is situated posteriorly, and consists of a pear-shaped sac which receives on either side a vein from the gills, dilated just before its termination into a muscular contractile antechamber or auricle.

The nervous system consists of the three pairs of ganglia common to the mollusca, concentrated round the œsophagus.

Of the sense organs the eyes are the most conspicuous. They occupy depressions in the head cartilage.

The ears are a pair of small closed vesicles, imbedded in the head-cartilage, and supplied by nerves which, though apparently springing from the pedal ganglia, really have their origin in the cerebral. A ciliated pit, usually considered olfactory, lies behind each eye. The sexes are separate. The testis and ovary are both single and situated in the hinder part of the body; the latter lies in the visceral sac or pericardium above described, the former in an almost closed diverticulum of it. The eggs have a tough capsule, with a projection at one end and a kind of handle at the other by which they are attached in bunches to a twig of seaweed or other similar substance.

Cuttlefish are found in littoral regions or in moderately deep water; ordinarily they rest horizontally on or near the bottom, the fins gently undulating, the tentacles retracted, and the arms depressed. Progression may take place by means of the fins with considerable rapidity in either direction, the funnel being turned so that the stream of water issuing from it

assists in propulsion; rapid darts backward when the animal is alarmed are brought about either by the sudden ejection of water through the siphon, or by spreading out and reuniting the arms. See CEPHALOPODA; SQUID.

Cutty Stool, the stool of repentance, a seat formerly set apart in Scottish kirks, on which offenders against chastity were exhibited before the congregation and submitted to the minister's rebukes before they were readmitted to church privileges.

Cuttyhunk, Mass., an island in Buzzard's Bay. It was on this island that Bartholomew Gosnold landed, on 25 May 1602, and there established the first settlement of white men in that part of the world. He named the island after Queen Elizabeth, calling it Elizabeth Isle. The settlement did not continue a full month before it was abandoned, the colonists returning to England. It is now used chiefly as a place of summer resort.

Cuvier, Georges Chrétien Léopold Dagobert, zhŏrzh krā-tē-ĕn lā-ō-pōld dā-gō-bār kü-vē-ā, BARON, French naturalist: b. Montbéliard, France, 23 Aug. 1769; d. Paris 13 May 1832. After finishing his education at Stuttgart he accepted the situation of tutor in a Protestant family in Normandy. The Abbé Texier, whom the troubles of the time had driven into exile from the capital, introduced him by letter to Jussieu and Geoffroy. Several memoirs, written about this time, and transmitted to the latter, established his reputation and procured his admission to two or three of the learned societies in Paris. In 1800 he was appointed successor to Daubenton as professor of natural history at the College of France, and in 1802 succeeded Mertrud in the chair of comparative anatomy at the Garden of Plants. From that time he devoted himself steadily to the studies which have immortalized his name.

Cuvier's 'Lessons in Comparative Anatomy,' and the 'Animal Kingdom,' in which the whole animal kingdom is arranged according to the organization of the beings of which it consists, have raised him to the pinnacle of scientific fame, and established him as the first naturalist of his time in the world after Linnæus, the celebrated Swedish botanist.

His numerous memoirs and works on these subjects show a master-mind in the study of zoology; and extending the principles laid down in his comparative anatomy to the study of palæontology, he has been enabled to render immense service to geology. Starting from the law that there is a correlation of forms in organized beings — that all the parts of each individual have mutual relations with each other, tending to produce one end, that of the existence of the being — that each living being has in its nature its own proper functions, and ought therefore to have forms appropriated for that function; and that consequently the analogous parts of all animals have received modifications of form which enable them to be recognized — he was able to ascertain from the inspection of a single fossil bone, not only the family to which it ought to belong, but the genus to which it must be referred. Even the very species of animal was thus to be made out, and the restoration of its external form as it might have lived and died became in his hands an object of certainty and precision. His 'Animal Kingdom' has been frequently translated, and forms the basis of all arrangements followed at the present time. Cuvier filled many offices of great importance in the state; particularly those connected with educational institutions. Napoleon treated him with much consideration; Louis XVIII. and Charles X. advanced him to honor; and Louis Philippe raised him to the rank of a peer of the realm. See Candolle, 'Notice sur la Vie et les Ouvrages de G. Cuvier'; Lee, 'Memoir of Baron Cuvier' (1833); Lomenie, 'G. Cuvier, par un homme de rien' (1841); Florens, 'Cuvier; Histoire de ses Travaux' (1845); de Blairville, 'Cuvier et Geoffrey Saint Hilaire' (1890).

Cuvillier-Fleury, Alfred Auguste, French author: b. Paris 18 March 1802; d. there 18 Oct. 1887. He was educated in the Collège Louis-le-Grand, became private secretary to Louis Bonaparte, ex-king of Holland, in 1819; tutor to the Duke of Aumale in 1827, and entered the staff of the *Journal des Dèbats* in 1834. He was made a member of the Academy in 1866. Among his works are: 'Voyages et Voyageurs' (1854); 'Etudes, Historiques et litteraires' (1854); 'Nouvelles Etudes' (1855); 'Dernières etudes historiques et litteraires' (1859); 'Historiens, Poètes et Romanciers' (1863); 'Etudes et Portraits' (1865); etc.

Cuxhaven, kooks'hä-fĕn, Germany, a fortified seaport at the mouth of the river Elbe, in a detached portion of territory belonging to Hamburg. The old harbor is one of the safest on the coast, is often resorted to in cases of danger. Many passengers for foreign parts embark at Cuxhaven, which is annually rising to greater importance. Here vessels generally take pilots to go up the river to Hamburg and other places. These pilots are privileged, and by their statutes are compelled always to keep pilot-vessels out at sea, with men ready to conduct any vessel which may demand assistance. Pop. (1901) 7,000.

Cuyabá, koo-yä-bä', Brazil, the capital of the state of Matto Grosso, situated on the Cuyabá River, a part of the Paraguay River system. It was founded early in the 18th century by adventurers from São Paulo, in search of gold. The climate being somewhat more healthful than that of other portions of the state, it has retained a moderate degree of prosperity since the mining industry terminated. A military arsenal and barracks are located here. From Rio de Janeiro in a direct line the distance to Cuyabá is about 840 miles, but only one third of the railroad has been completed which is to connect Cuyabá with the coast, through São Paulo. At the present time transportation is mainly by way of the Paraguay and La Plata rivers to Buenos Ayres; thence by the Atlantic to the national capital — a total distance of about 3,720 miles. Pop. a little more than 8,000. See MATTO GROSSO.

Cuyler, kī'lĕr, **Theodore Ledyard,** American Presbyterian clergyman: b. Aurora, N. Y., 10 Jan. 1822. He was graduated at Princeton College in 1841 and at Princeton Theological Seminary in 1846. From 1860 to 1890 he was pastor of Lafayette Avenue Presbyterian Church in Brooklyn, resigning to devote his time to literary and reform work. In 1900 he sup-

perted McKinley for the presidency while opposing imperialism. He has written: 'Newly Enlisted'; 'Christianity in the Home'; 'Cedar Christian' (1863); 'The Empty Crib' (1868); 'Heart Life' (1871); 'From the Nile to Norway' (1881); 'Stirring the Eagle's Nest' (1880); 'Beulah Land'; 'Mountain Tops with Jesus'; 'Our Christmas Tides' (1904); etc. He has been a constant contributor to the religious press and besides his published volumes has written some 3,000 articles and letters in newspapers and magazines, many of these having been reprinted in England. At the observance of the 25th anniversary of his Brooklyn pastorate it was stated that he had admitted into his church by membership 3,010 persons.

Cuyo, koo'yō, Philippines, a town and the capital of the province of Paragua, situated on the southwestern coast of the island of Cuyo, Cuyos group. The town is well built, and has an important trade. It is protected by a fort built on a land spit near the town. Pop. 8,258.

Cuyos Islands, Philippines, a group of 47 islands lying south of the island of Mindoro, and east of Palawan; total area, 63 square miles. The most important island of the group is Cuyo, 8 miles long; area; 20 square miles. The islands, with the exception of Cuyo, are infertile, and there is but little manufacture; the chief industry is the gathering and preparation of edible birds' nests and trepang. By the civil government act of 1002, these islands were made a part of the province of Paragua, Palawan.

Cuyp, koip, or **Kuyp, Albert,** Dutch artist: b. Dordrecht 1605; d. there 1691. He was a son of Jacob Cuyp (q.v.), and excelled in the painting of cattle grazing or reposing, moonlights, wintry landscapes, still waters with ships, horse-markets, hunts, camps, and cavalry fights; and in rendering effects of warm golden sunlight he is without a rival. During his lifetime and long after, Albert's pictures, though in many respects equal to those of Claude, were held in little estimation. Opinion, however, has now changed regarding them, and a fine example of his art has realized over $25,000.

Cuyp, Benjamin, Dutch artist: b. Dordrecht 1608; d. 1672. He was a nephew of Albert Cuyp (q.v.), and became a member of the guild in Dordrecht in 1631. He painted biblical pieces in Rembrandt's style, and familiar scenes of country life. His best works are in the manner of Teniers.

Cuyp, Jacob Gerritse, yä kōb gĕr-rēt'sĕ, Dutch painter, commonly called the Old Cuyp; b. Dordrecht 1575; d. 1651. Jacob Cuyp's representation of cows and sheep, battles, and encampments, are clever, but his fame rests principally on his excellent portraits. His coloring is warm and transparent; his manner, free, and spirited. Cuyp was one of the four founders of the Guild of St. Luke at Dordrecht.

Cuyuni, koo-yoo'nē, a river of South America, rises in Venezuela, flows first north, then east, through British Guiana, and into the Mazaruni. It has numerous rapids and falls; the lowest is 30 miles above the mouth.

Cuzcatlán, kooz-kät-lan', Salvador, C. A., an Indian town, capital of a nation which occupied the territory represented by the modern departments of San Salvador and Cuscatlán. It was taken by the Spaniards under Alvarado in 1524. See Cuscatlán.

Cuzco, kooz'kō, Peru, a department in the southeastern part of the republic, bounded by the province of Loreto on the north, by Bolivia on the northeast and east, by Puno and Arequipa on the south, and by Apurimac, Ayacucho, and Junin on the west. Its area is 27,285 square miles. Within its limits are found nearly all varieties of temperature, with the corresponding products. The fertile valleys of the Vilcamayo enjoy an Italian climate; toward the Bolivian frontier there are vast tropical forests, abounding in all the productions of the torrid zone; on the slopes of the Andes are plains covered with pasture or crops of cereals; and still higher up on the table-lands and peaks are large flocks of vicuñas and alpacas. In general, the easterly regions have the characteristics of the upper Amazon country, while the southwest is extremely mountainous, with beautiful and healthful elevated plains or valleys, like that in which the city of Cuzco is situated. Pop. of the department about 240,000.

Cuzco, Peru, the most famous ancient city of South America. Situated in lat. 13° 31′ S., and lon. 73° 3′ W., Cuzco is at an elevation of 11,380 feet above the sea (compare Mount Washington, 6,288 feet, and Mont Blanc, 15,779 feet), and its climate is temperate; but in winter snow often falls. It was the chief town of the Inca tribe (q.v.). The writings left by Spanish conquerors and early chroniclers, upon which subsequent accounts have been based, not only preserved the Indian myths but also added some fanciful details in regard to the place, the inhabitants, and their institutions. According to such myths and accounts, the founder of the city was Manco Ccapac, son of the sun-god; strong walls, we are told, surrounded it, and in its midst was a great square, from which started four roads binding together the "empire of the four quarters of the world" (in the native tongue, "Tahuantinsuyu"), the first road leading to Puitu, the modern Quito, the second over the Andes, the third to Chile, and the fourth to the ocean. The temple of the sun, with the surrounding dwellings for priests and virgins of the sun, occupied a district of the city called "The Golden." Five mighty walls enclosed that sacred place. The temple itself was circular in form. Its chief hall, dedicated to the sun-god, contained an image of the sun made of beaten gold; the door-posts were of gold; all the walls were covered with disks of the same metal; and the mummies of the Incas ranged beside the god were decked out with golden ornaments. A door encased in silver led to a chapel dedicated to the moon-goddess, sister and wife of the sun-god. Here the images and furnishings were of the white metal, and the mummies of the wives of the Incas were decorated with silver. A part of the site of the temple is now occupied by the Church of S. Domingo. The Sacsahuaman fortress overlooked the city from a hill 250 metres high. It had a triple wall, built of enormous stones. Through deep ravines on either side of the Sacsahuaman hill flow the little rivers of Huatanay and Rodadero, the former passing beneath the houses on the west side of the square, down through the centre of a broad street, where it is crossed by numerous stone bridges, and eventually uniting with the Roda-

dero. The main part of the old city was built between these two rivers; and even to-day the houses there commonly show the massive masonry of the Inca architecture in their lower portions, though having a modern superstructure. Now, as formerly, the streets run at right angles. The government established by the Incas, though in form a despotic theocracy, was relatively mild and patriarchal. Nowhere and never have there been chiefs of state so successful in monopolizing all power, all initiative. Accordingly, when the Spanish conqueror Pizarro captured Inca Atahulapa, the people were incapable of effective resistance. Atahualpa's successors were Huascar and Manco. The former was slain; the latter was induced by promises of friendship to lead the Spaniards into Cuzco (15 Nov. 1533). An enormous booty was obtained by despoiling the temples and palaces. Besides gold and silver, the common soldiers received 200 slaves each, and the sacred sun-maidens were treated as a part of the loot. In 1536 the last of the Incas, Manco, besieged the city unsuccessfully. It remained the principal Spanish stronghold for a long time, though Pizarro founded Ciudad de los Reyes (Lima) 6 Jan. 1535. Extremely interesting are the remnants of the fortifications, temple, etc., some of which are constructed of huge masses of rock (one piece 16 feet in height; others 10 and 12 feet) of irregular shape, yet made to fit exactly one into the other with minute accuracy, as in mosaics. Such works, constructed before 1370, are scarcely surpassed by any in the world in respect to their solidity and the skilful workmanship they attest. Among the public buildings are the Cabildo, the university, library and museum, etc. The city has suffered from lack of means of transportation and communication. Only in the last few years has an effort been made to connect it by railroad with the Titicaca region. It has shrunken in trade as in population. Gold and silver work, leather, sugar, cotton, linen and wool are produced to a limited extent. The inhabitants at the time of the conquest numbered perhaps 100,000; a century ago about 50,000; at present about 30,000.

Cyanide Process. See GOLD.

Cyanides, sī'ą-nīdz or sī'ą-nīdz. See HYDROCYANIC ACID.

Cyanin, sī'ą-nĭn, the blue coloring-matter of certain flowers, as the violet and corn-flower.

Cyanite. See KYANITE.

Cyanogen, sī-ăn'ō-jĕn, a colorless poisonous gas which liquefies at — 25°, or under a pressure of four atmospheres at 20°, and at — 34° becomes crystalline. It burns with a peach-blossom-colored flame, forming CO_2 and nitrogen; water dissolves four volumes, and alcohol 23 volumes of the gas. It is very poisonous, and smells like prussic acid. Cyanogen gas passed into strong aqueous hydrochloric acid is converted into oxamide. Nascent hydrogen from tin and hydrochloric acid converts cyanogen into ethylene-diamine, $N_2(C_2H_4)''H_4$. A solution of cyanogen in water turns dark and deposits azulmic acid, $C_4H_5N_5O$, and the solution contains hydrocyanic acid, urea, and oxalate and formate of ammonia. Cyanogen dissolves in an aqueous solution of potash, forming cyanide and isocyanate of potassium. It may be regarded as the nitril of oxalic acid. Dry ammonia gas and cyanogen combine, forming hydrazulmin, $C_4N_6H_6$. Small quantities of cyanogen are formed during the distillation of coal.

Cyanometer, sī-ą nŏm'ĕ-tĕr ("measurer of blue"), the name of an instrument invented by Saussure for ascertaining the intensity of color in the sky. It consists of a circular piece of metal or pasteboard, with a band, divided by radii into 51 portions, each of which is painted with a shade of blue, beginning with the deepest, not distinguishable from black, and decreasing gradually to the lightest, not distinguishable from white. It is used in the open air, and the observer holding it up between himself and that part of the air whose color he wishes to ascertain, and in such a position as to secure its being strongly enlightened without receiving the direct rays of the sun, turns it gradually round on its own plane till he perceives an exact similarity between the tint of the instrument and the tint of the sky. The number of that particular tint as marked on the instrument marks the intensity of color in the sky at that particular period.

Cyanophyceæ (Gr. "dark-blue"), the lowest group (blue-green) of *Algæ* (q.v.). Their color is caused by the diffusion of phycocyan, a blue pigment, throughout their cell-contents. In this group no sexual reproduction has been observed, the only reproductive means known to exist in it consisting of spores and hormogonia of a non-sexual character.

Cyanose, sī'a-nōs, native sulphate of copper ($CuSO_4$, $5H_2O$), met with generally in stalactitic or reniform masses, but sometimes in well-defined crystals. It is dark-blue, translucent, vitreous, brittle, readily soluble in water, and with a most disagreeable metallic taste.

Cyanosis, sī-ą-nō'sĭs, a condition of diminished oxidation in the blood, causing lividity of the skin, blueness of the lips, and symptoms of weakness and fainting. It may be a permanent affection, such as is seen in blue babies, in whom the venous blood obtains access to the arteries without passing through the lungs to be oxidized; or it may be a temporary condition due to choking, to excessive coughing as in false croup, or in true diphtheria. It also results as a temporary condition in poisoning by means of a number of the newer drugs used for headaches and vague pains, such as acetanilid and the like. It may also result from coal-gas poisoning, and a large variety of other forms of poisoning. Removal of the source, if possible, fresh air, oxygen, artificial respiration, are useful in the treatment of the condition. The congenital varieties are unmodifiable.

Cyan'otype Process, a method whereby photographic pictures are obtained by the use of a cyanide. This process is in common use by architects and engineers for copying plans, producing an image with white lines on a blue ground. Sensitive paper is made by brushing it over with a solution of ferric oxalate (10 grains to the ounce); it is then exposed under the positive and treated with a solution of potassium ferricyanide, by which the image is developed. The color of the ground is deepened by subsequent washing with solution of potassium bisulphate.

Cyanuric (sī-ą-nū'rĭk) **Acid** (from "cyanogen" and "uric"), an organic acid having the

formula $C_3N_3O_3H_3$, and obtained by the dry distillation of uric acid. It is a polymer of cyanic acid, CNOH, and may be obtained, along with another polymer of unknown molecular weight called cyamelide, by the spontaneous polymerization of cyanic acid. To obtain it in this way, potassium cyanate, CNOK, is treated with hydrochloric acid in the presence of ether, the mixture being well shaken. Potassium chloride and cyanic acid are formed, the latter polymerizing at once into the two compounds mentioned above, the cyanuric acid that is formed being taken up by the ether, from which it may afterward be recovered by evaporation. Cyanuric acid forms colorless efflorescent crystals which contain two molecules of water when deposited from solution in water. The hydrous crystals have the form of rhombic prisms; but anhydrous crystals, octahedral in form, are also known. Cyanuric acid dissolves in hot nitric, hydrochloric, or sulphuric acid, there being no decomposition unless the action is prolonged. When heated it becomes converted into cyanic acid, this reaction being one of the tests that are employed for its detection.

Cyath'ea, a genus of arborescent ferns, order *Polypodiaceæ*, characterized by having the spores, which are borne on the back of the frond, enclosed in a cup-shaped indusium. There are many species scattered over the tropical regions of the world. *C. medullaris* is a fine New Zealand species of comparatively hardy character. The soft, pulpy, medullary substance in the centre of the trunk is an article of food somewhat resembling sago. This species and the South African *C. dealbata* are cultivated as ornamental plants. *C. arborea* is a West Indian species.

Cyathom'eter, a recently invented apparatus for determining the level and volume of liquids in closed vessels. It is adapted to bottles and to stationary vessels and is designed especially to prevent fraud in the retail trade in valuable liquids. The apparatus consists of a glass tube fluted internally, of a glass telltale or float provided with two straight springs, and of a solid ball. The tube is suspended in a bottle arranged for the purpose at the time of manufacture, from a band of twisted wires of inoxidizable metal, the extremities of which, after passing through the neck, are united and provided with a lead seal. When a full bottle is provided with the cyathometer, the telltale is at the upper part of the tube. If a certain portion of the contents be poured out, the levels of the bottle and tube will descend together and the telltale will constantly follow them. If, on the contrary, any quantity whatever of liquid be added, the levels will rise, but the telltale, held by its springs, which are braced against the flutings of the tube, will remain where it was before the addition. It is therefore submerged and marks the precise point where the addition or substitution began. Any fraud will be revealed by the telltale at the very moment at which it occurred. When the cyathometer is adapted to vats, tanks, casks, etc., the telltale consists of a float and sleeve placed in contact, and each carrying three or four springs pointing in contrary directions, those of the float engaging with the sleeve. The apparatus lends itself also to the control of movable receptacles of large capacity.

Cybele, sib'ē-lē or sib-ē'lē, a goddess of the Phrygians, like Isis, the symbol of the moon, and what is nearly connected with this, of the fruitfulness of the earth, for which reason she is confounded with Rhea, whose worship originated in Crete, and in whom personified nature was revered. According to Diodorus Cybele was the daughter of the Phrygian king Mæon and his wife Dindyma. At her birth her father, vexed that the child was not a boy, exposed her upon Mount Cybelus, where she was nursed by lions and panthers, and afterward found and brought up by the wives of the herdsmen. She invented fifes and drums, with which she cured the diseases of beasts and children, became intimate with Marsyas, and fell violently in love with Atys. She was afterward recognized and received by her parents. Her father discovering her love for Atys had him seized and executed, and left his body unburied. The grief of Cybele on this occasion deranged her understanding and she began a long search for Atys. In art her original statue was nothing but a dark quadrangular stone. Afterward she was represented as a matron, with a mural crown on her head, in reference to the improved condition of men arising from agriculture and their union into cities. A common attribute of the goddess is the veil about her head, which refers to the mysterious and incomprehensible in nature. In her right hand she often holds a staff, as an emblem of her power, and in her left a Phrygian drum. Sometimes a few ears of corn stand near her. The sun also is sometimes represented in her right hand, and the crescent of the moon in her left. We sometimes see her in a chariot drawn by lions; or else she sits upon a lion, and, as omnipotent nature, she holds a thunderbolt; or a lion lies near her. These symbols are all representations of her dominion and of the introduction of civilization by her means in the period of barbarism.

Cycads (from *Cycas* = Neo-Lat. nom. pl. of Gr. *κύκας*, the original name of the African cocoa-palm), a group of naked-seeded or gymnospermous plants, the cycadales. The existing cycads are an ornate remnant of an ancient and once widely extended series of forms, their nearest living relative being the gingko or maidenhair-tree. The large pith of the thick palm-like trunk of certain species is the source of the sago starch of commerce, whence the common name, sago-palm.

The cycads are a primitive and composite type with the wood structure of pines (and *Cordaites*), certain frond and other characters of ferns, and the outward habit of palms. As in the latter, the stem elongates by the slow growth of a terminal bud, with the unfolding of successive crowns of leaves or fronds spirally arranged in close order. As the leaves wilt down, there is formed from their bases an outer more or less persistent armor, which gives the stem its very characteristic appearance. For trunk-forming plants the cycads are mostly small or even pygmean. They include tuberous to columnar forms, and vary in size from underground trunks a few centimetres in diameter with fronds no more than a decimetre long to the tallest species of *Cycas* (Fig. 2, plate), which may reach a height of 20 metres. The most robust trunks reach rarely a metre in

diameter and the longest fronds a length of four metres. Several Central American and Peruvian species are epiphytic. Most of the cycads branch one or more times after reaching a certain age, and all are handsome and easily grown greenhouse plants. The Japanese gardeners produce examples of their native species, *Cycas revoluta*, with from 15 to 20 branches, and some of these plants are known to be upward of 300 years old.



Fig. 1.— *Zamia floridana* DC. ♀ (From Wieland.) Miami, Florida, 15 November, fully six months previous to fecundation.
1a.— Entire plant. × 1-12.
a. main trunk (underground).
b. position of an old branch.
c. secondary tap root running out from the main foliage-bearing trunk, which is itself secondary.
d. primary or original tap root.
1b.— Cone (ten-ranked) seen in 1a. × ⅙.
1c.— Transverse section of a different cone. × ⅙. Eight sporophyllar ranks are seen. These cones vary much in size as well as in number of sporophyllar ranks, which may be odd or even. The number of sporophylls in each rank also varies.
1d.— Single sporophyll with ovules attached. × ⅓.
1e.— Pinnule showing dichotomous venation. × ½.

The cycads are widely dispersed in tropical and subtropical regions, but not usually abundant. *Zamia floridana* (Fig. 1), locally known as the coontie, occurs in thickly set clumps as underbrush in the more open pine woods of Florida, while *Z. pumila* is found more sparsely among the denser forest growths of the hammocks. The low-growing *Stangeria paradoxa* is abundant on the Natal border, and dense thickets of *Macrozamia spirali* cover wide stretches, to the exclusion of other growths, in southeastern Australia. But as a rule the cycads now play a rather inconspicuous role in forest facies, as compared with that of Mesozoic times as indicated by the fossil record. The more general type of occurrence in small open dells, as fern-like forest growths, is illustrated in the accompanying plate.

The stem consists finally in a thin zone of wood, cambium, and bast, enclosing a large medulla, and enveloped by a thick cortex, this being in the main the arrangement in all the gymnosperms and the dicotyls. But there is this difference: the cortex supports primarily the primitive outer investiture or armor of old foliar bases, which is quite persistent in some

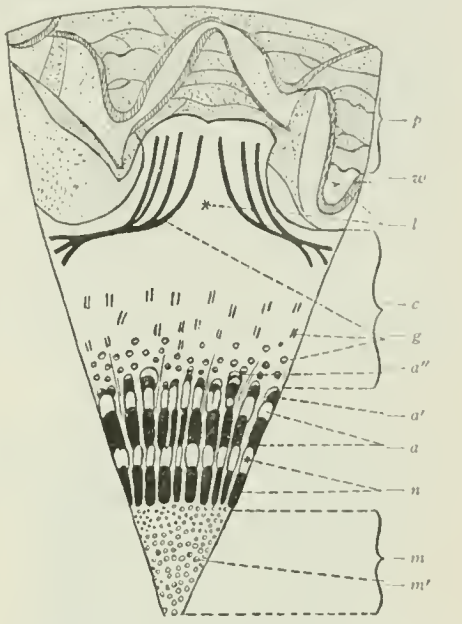


Fig. 3.— *Macrozamia Fraseri*. Transverse section of trunk × ½. (From Worsdell.) *p*, periderm in successively formed layers; *w*, wall of one of the leaf bases; *l*, leaf base; *c*, cortex; *g*, girdle leaf traces; *a''*, isolated bundle of a 3d anomalous wood zone; *a'*, 2d anomalous wood zone; *a*, 1st anomalous wood zone; *n*, normal wood (xylem dark, phloem light); *m*, medulla; *m'*, medullary bundle.

forms, but in others is more or less rapidly excised by the formation of successive layers of periderm, at first arising within the leaf-bases, and then in the cortex itself, with the casting off of thin bark. Moreover, in *Cycas*, *Macrozamia*, *Encephalartos*, and *Bowenia*, the woody cylinder does not as in the other genera remain single. After a time the primary cambium becomes inactive, and there successively arise in the cortex secondary cambiums of diminishing power and regularity. From these are produced the so-called "anomalous wood zones," which may rarely increase to a dozen.

The principal features of this second or polyxylic trunk type are shown in Fig. 3, together with the addition of a medullar system of anastamosing cauline bundles. These also occur in the pith of *Encephalartos*. The cortical bundle system is a complex one, varying greatly in the several genera, and including in part bundles or "girdle leaf traces" of a primitive concentric structure.

The cycads, unlike all vascular cryptogams, send down a primary root which continues as a tap-root. In the case of such subterranean trunks as those of certain species of *Zamia* (Fig. 1), the tap-root remains prominent, and its lateral branches are relatively small, the trunk assuming a carrot-like form. But in most genera the root system comes to be quite fila-

mentosus, being largely made up of freely branching adventitious roots.

The leaves or fronds are usually of two kinds, scale and foliage. There are also the fertile or carpellary leaves of *Cycas*. All appear in terminal rosettes in the order named, scale, foliage, and when present, carpellary leaves. The scale leaves are dry and aborted foliage leaves, and are present in all but certain species of *Macrozamia*. The elliptical to acuminate foliage leaves are bipinnate in *Bowenia*, and pinnate in all the other genera. Prefoliation is erect in *Dion* and *Macrozamia*. In *Cycas* the rachis is straight, but the pinnules are circinately rolled like those of ferns. Conversely in several other genera the pinnules lie straight along the once deflexed rachis. The pinnules, various types of which are shown (Fig. 4, plate), are of hard to leathery texture, much varying size and form, and dichotomous venation, except in *Cycas*, which has a single midvein. Those of *Stangeria* are very fern-like. The anatomical structure is much as in certain conifers and the extinct *Cordaites*.

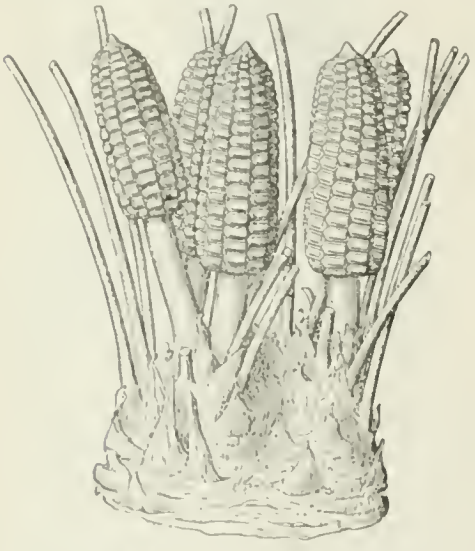


FIG. 5.— *Zamia floridana* DC. ♂ × ½. November stage of growth. Slightly bifurcate trunk bearing three staminate cones on the right and two on the left. Trunk shown with leaves removed and as if cut away on the ground level. (From Wieland.)

Fructification.— The living cycads are all diœcious. The microsporophylls are always organized into cones which may vary from a few centimetres long to enormous forms 80 centimetres long by 15 or more centimetres in diameter, bearing as many as 600 microsporophylls, these being the most massive to be seen in seed plants. Several forms of microsporophylls are shown isolated (Fig. 6, plate), and staminate cones (Fig. 5) as borne on the parent plant. The sporangia are borne on the under side of the sporophyll and are structurally much like those of *Angiopteris* among the *Marattiaceæ*. In certain genera there is an obscure grouping into sori (Fig. 6, plate, A, B, and C).

The ovules, which are the largest known in the vegetable kingdom, are in the genus *Cycas*, doubtless the most primitive type among recent phanerogams, borne on the margins of modified leaves, emergent in regular series like the ordinary foliage leaves. In the other genera the megasporophylls each bear but a single pair of ovules, and are organized into a large terminal cone, or several such cones. See illustration of principal types of megasporophylls (Fig. 7, plate). The ovulate and staminate strobili agree in general form, and in the terminal or nearly terminal position in which they are borne in all the genera. After the production of cones in plants of either sex the stem continues its growth as a sympode.

Fecundation.— Among the various primitive characters of the cycads going to prove their descent from homosporous tree-ferns, easily the most recondite is the occurrence of motile multiciliate male cells of the coiled type characteristic of all the Pteridophytes except the club mosses. Spermatozoids are doubtless common to all the cycadales and are present in gingko, but are not known in any other phanerogams. The pollen grains are drawn through the micropylar tube into the pollen chamber (by suction), after which the pollen tube ruptures the exine and enters the nucellar tissue, where it may branch. Meanwhile spermatozoids form from the generative cells and, after the rupture of the pollen tube, swim actively to the archegonium through a liquid medium afforded in part by the tube, and probably also by extrusion from the egg-cell. The mature spermatozoids are the largest known in any plant (or animal), at least in *Zamia floridana*. In this species they are visible to the naked eye, and have been studied alive in sugar solutions. They are of nearly spherical top-shape, with a ciliferous spiral running from the apex to the middle region, and motion is mainly by means of their cilia, but there is also amœboid motion of the spiral end (see Figs. 8 and 9).



FIG. 8.— *Zamia floridana* DC. End of mature pollen tube after formation of the cilia of the two spermatozoids and just before these pull apart to swim free to the archegonia. × 50. (From Webber.)



FIG. 9.— *Zamia floridana* DC. Mature spermatozoid while swimming free. × 100. (From Webber.)

From this most primitive form of fecundation known in flowering plants, it seems evident that not until the later stages of plant evolution did the pollen tube begin to serve as a direct means of transfer of the male cells as in other phanerogams.

The seed-coats instead of being entirely woody, as in the conifers, develop a lignified inner and a pulpy outer layer. In the cone-bearing forms appression faces form, but in *Cycas* the free seeds look much like plums, those of *C. circinalis* reaching the size of goose-

eggs. The embryo is one to three cotyledonous. Structurally cycad seeds are closely analogous to those of *Gingko* and the *Cordaitales*.

Classification and Geographic Distribution.— The living cycads include 107 species divided into two families, the *Cycadaceæ*, with the single genus *Cycas* and the *Zamiaceæ*, including the other genera. The species are nearly equally divided between the New and Old World tropical and sub-tropical regions. There are four indigenous Occidental genera as follows: *Zamia*, with 37 species, ranges over the mainland from Florida, where two species occur, to Brazil, and also over the West Indies; *Ceratozamia*, with six species, and *Dion* with two, are mainly Mexican and Central American; while the monotypic *Microcycas* is Cuban. In the Orient five genera occur: *Cycas*, with 23 species, is the most notable, and ranges over Australia, the East Indies, and Japan; *Macrozamia*, with 12 species, and the monotypic *Bowenia* are both strictly Australasian; while *Encephalartos* with 20 species, and the ditypic *Stangeria* are African.

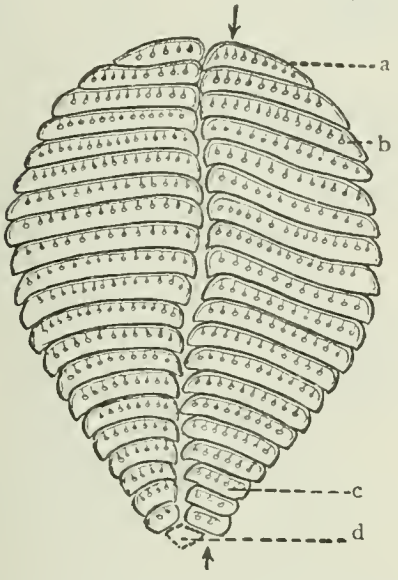


FIG. 11.—*Cycadeoidea ingens*—type specimen. Transverse section through upper portion of a single one of the yet folded crown of young fronds as fossilized when just about to emerge from the ramentum. The top side is next the centre of the trunk.

a, a pinnule cut near its summit; *b*, one of the transversely cut vascular bundles; *c*, a pinnule cut near its base; *d*, position of rachis. × 4. (From Wieland.)

Fossil Cycads.—As in the case of various unique types in the existing flora, the present isolation of the cycads is connected with a history of great extent in space and time. The living forms are only two side branches of a varied cycadalean group, of which the *Cycadaceæ* are the more ancient, characteristic leaves of the *Cycas* type having already been present in the Carboniferous limestone.

The *Zamiaceæ* were already present in the Jurassic, during which period cycadaceous types apparently culminated in both variety and extent.—Noteworthy is the occurrence of an associated leaf and fruit justly referred to the living genus *Cycas* in the upper Cretaceous (Atane Beds) of Greenland. Since Cretaceous time the northern limit of the cycads has slowly retreated from the Arctic area to its present position. A species referable to the African *Encephalartos* was yet left behind in the lower Miocene of southern Europe.

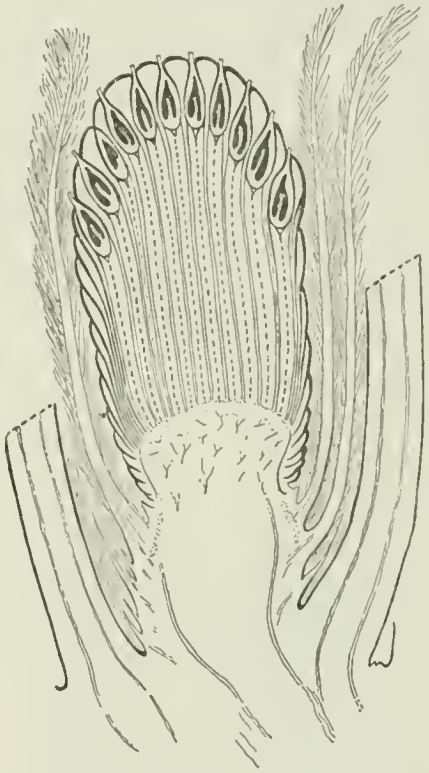


FIG. 12.—*Cycadeoidea Wielandi*. Longitudinal section through an ovulate strobilus borne on trunk 393 of the Yale collection. Exteriorly are the old leaf bases shown partly cut away. The fruit arises from the axil of that to the right. The bundle supply of the leaf bases and thick peduncle is shown, also the exterior hairy bracts. × $\frac{2}{3}$. (From Wieland.)

Bennettiteæ.—In addition many cycad-like plants are known, from the Cretaceous on, which are but distantly related to the living forms. Among these the *Bennettiteæ* are of deep interest from an evolutionary point of view, and may represent a fifth great group of the gymnosperms, the Bennettitales. Interesting imprints of leaves, fruits, and stems belonging to this group are known with certainty from the Trias of southern Sweden, and the general type seems to have extended quite over the globe in Jurassic time. Beautifully silicified trunks with microscopic structure preserved have been found in considerable number in the European Jurassic and Cretaceous, also in Maryland, and more recently in the Black Hills region in uppermost Jurassic or else lowermost Cretaceous strata. The American specimens include both low-branching trunks (Fig. 10, plate) and columnar forms, and are now among the best-known of ancient plants. These trunks are usu-

ally referred to the genera *Cycadeoidea* and *Cycadella*. They possess abundant ramentum and are more fern like than are those of the living cycads, with which there is, however, in most essentials of trunk, and especially in leaf-structure, as determined from the silicified crowns of young leaves discovered by Wieland (Fig. 11), a close agreement. But in fructification they are entirely different.

The ovulate cone is a bract-enveloped spherical to pear-shaped and small to full pear-sized body, terminating a short axillary shoot emerging laterally on the trunk from among the old leaf bases and ramentum, as here illustrated (Fig. 12). In structure this fruit is wholly unique. The end of the peduncle expands into a fleshy convex or conical receptacle, on which is inserted, as if fused into a single body, a series of sterile scales, and fertile sporophylls. Each of the latter bears at its end a single seed with the elongate micropylar tube directed outward from between the expanded tips of the non-fertile interstitial scales, which are of such

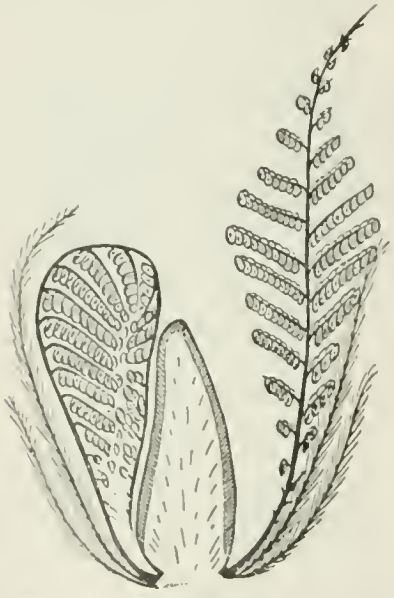


FIG. 13.—*Cycadeoidea*. Longitudinal section through bisporangiate strobilus. Diagrammatic. At the centre is the apical ovulate cone closely invested by a zone of short stalked ovules and interseminal scales. On the left is a single once pinnate and yet folded fertile frond of the staminate disk. On the right a similar synangia-bearing frond is arbitrarily shown in an expanded position. Exteriorly are the imbricating hairy bracts. About ¾ natural size. (From Wieland.)

evenly decreasing length from the centre of the receptacle to its periphery, as to thus form a continuous outer covering of the fruit. Basally there are sterile organs only. The ellipsoidal seeds are about three millimetres long, orthotropous, exalbuminous or nearly so, and dicotyledonous. Perhaps the nearest approach in general form among plants now living to the present type of fructification is to be seen in the peculiar ovulate strobilus of certain species of the monocotyl *Pandanus*, rather than in any known cycads whatsoever. The staminate fructification is even more noteworthy (Fig. 13). It is bisporangiate, and also a lateral bract-enveloped shoot. At the centre is an ovulate cone of the structure just described *which may in some species be functional*. In any case an earlier bisexual condition is indicated, from which both monœcious and dioecious forms were derived. Surrounding the ovulate centre is an hypogynous staminate disk, made up in different

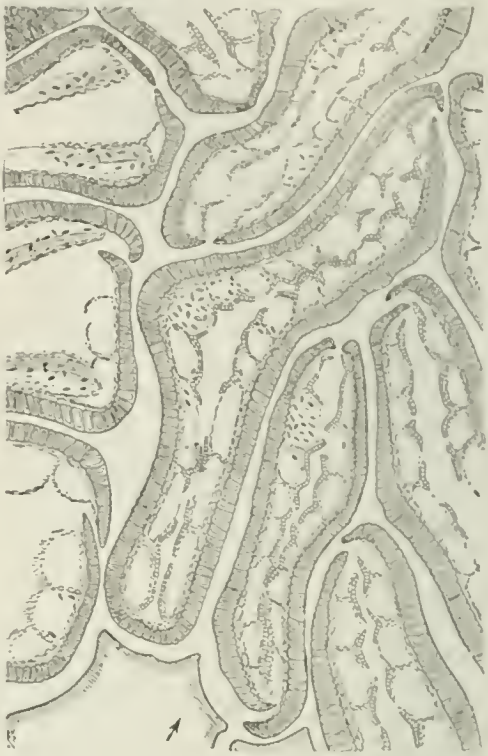


FIG. 14.—*Cycadeoidea dacotensis* Macbride. Portion of a transverse section through one of the bisporangiate strobili, cutting adjacent synangia. In the central synangium the outer covering of heavy walled prismatic cells is seen to be followed by a thin-walled layer. Adhering to this are the sporangial loculi closely ranged on each side of the synangium in two rows. Each loculus is delimited by bands of collapsed cells with adhering pollen grains, and each row of loculi is bounded on the inner side by well defined tissue a single cell in thickness, except between the angles of adjacent loculi, where there is a thickness of several cells. This layer thus bounds the two opposed inner faces of the synangium. It is usually split on the median line of the sporangia, and the striate appearance of its elongate cells when cut obliquely is indicated in several instances.

The tips of the three synangia on the left side of the figure are seen to be oriented nearly at right angles to the others, being cut very obliquely. At the lower left-hand corner portions of two transversely cut sporophylls are seen. × about 25. (From Wieland.)

species of from 12 to 20 once pinnate fertile fronds with basally adnate petioles, each frond having been once deflexed in prefloration. When fully expanded, these flowers were quite 30 centimetres in diameter, and must have been objects of great beauty. The pollen-bearing or staminate fronds are of essentially filicinian form. The pollen is borne, as explained in fuller detail (Figs. 14 and 15), in synangia nearly identical structurally with the asexual spore-bearing synangia of the living tree fern

Marattia. Thus these fossil fruits exhibit a striking intermediate condition indicative of the evolution of heterospory in these gymnosperms from some ancient homosporous marattiacean stock. Moreover, while the staminate disk surrounding the ovulate axis here indicates primarily an evolution terminating in the gymnosperms, the juxtaposition of parts is exceedingly suggestive of the possibility, if not the manner as well, of angiosperm development directly from filicinian forms.



FIG. 15. — *Cycadeoidea dacotensis*. Macbride. Longitudinal section (in the narrow direction) through a synangium, showing attachment to the sporophyll, the several layers of the synangial wall, its dehiscence, the attachment of the sporangia, and the median sulcus between them. The basal buttressing of the outer wall is characteristic. Pollen grains shown enlarged. × 37. (From Wieland.)

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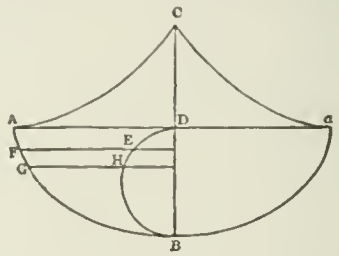
Cyclades, sīk'lā-dēz, or **Kyklades**, the ancient and likewise the modern name given to the principal group of islands in the Grecian Archipelago, now belonging to the kingdom of Greece, and formed into a separate province. The largest islands of the group are Andros, Paros, Myconos, Tenos, Naxos, Melos, and Thera or Santorin. They are situated between lat. 36° and 38° N., and lon. 24° and 26° 30′ E. They are generally mountainous, and evidently of volcanic formation. Hermopolis is the principal trade centre. Pop. about 143,828.

Cyclamen, sīk'la-mĕn, a genus of perennial herbs of the natural order *Primulaceæ*. There are about a dozen species, mostly natives of the Caucasus and the Mediterranean region, and characterized by flattish turnip-like tubers or corms, long-stemmed, more or less rounded or heart-shaped leaves, and solitary, single flowers with reflexed petals of great range of color. The best known species grown in America is *C. latifolium*, popularly known as *C. persicum*. It has produced a very large number of horticultural varieties, including some double forms, and is probably the most satisfactory window gardening plant, because of the profusion of its blossoms during many months, and also because of the simplicity of its culture. The seeds are

sown in early winter and kept steadily growing until the following winter, when they should commence to blossom; that is, in from 12 to 15 months. The roots must not be allowed to dry up like other bulb roots. The plants do not stand the heat of American summers and are therefore less popular as garden flowers than in Europe. The name sow-bread is sometimes given to the species chiefly cultivated in the United States, because swine are fond of the acrid tubers.

Cycle (Greek, *cyclos* or *kuklos*, a circle) is used for every uniformly returning succession of the same events. On such successions or cycles of years rests all chronology, particularly the calendar. Our common solar year, determined by the periodical return of the sun to the same point in the ecliptic, contains 52 weeks and one day, and one day more each leap-year. Consequently in different years the same day of the year cannot fall upon the same day of the week; for example, the year 1894 began with a Monday, 1895 with a Tuesday, 1896 with a Wednesday; but 1897, being preceded by a leap-year, began, not with a Thursday, but with a Friday. If we count only common years, it is manifest that from seven years to seven years every year would begin again with the same day of the week as the seventh year before; or, to express the same in other words, after seven years the dominical letter would return in the same order. But as every fourth year, instead of a common year, is a leap-year, this can only take place after 4×7, or 28 years. Such a period of 28 years is called (1) a solar cycle, and serves to show the day of the week falling on the first day of January in every year. For this purpose it is only requisite to know with what day of the week a particular year began, and then to prepare a table for the first days of the 27 following years. It is the custom now to fix the beginning of the solar cycle at the ninth year B.C., which was a leap-year, and began with Monday. If you wish to know what day of the week the new-year's day of any year of our reckoning is, you have only to add nine to the number of the year, and then, after dividing this sum by 28, the quotient gives the number of complete cycles, and the remainder shows what year of the solar period the given year is, of which the table above mentioned gives the day of the week with which it begins. But this reckoning is only adapted to the Julian calendar. In the Gregorian it is interrupted by the circumstance that in 400 years the last year of the century is three times a common year. Hence this reckoning will not give the day of the week for the first day of the year; but from 1582 (the commencement of the Gregorian calendar) to 1700 for the 11th, from 1700 to 1800 for the 12th, in the 19th century for the 13th day of the year, and so on, from which we must then reckon back to the new-year's day. Hence it is far more convenient to prepare a table for the beginning of a century (for example, for 1801, which began with Thursday), and divide by 28 the number of years from that to the given year, and with the remainder seek in the table the day of the week for the first day of the year. Besides this another cycle is necessary for the determination of festival days, by the aid of which the feast of Easter, by which all the movable feasts are regulated, is to be reckoned. Easter depends on the first full moon after the vernal equinox. (2) The lunar cycle is a period of 19 years, after which the new moon falls again on the same day of the month. On 2 Jan. 1813 there was a new moon; 2 Jan. 1832 there was a new moon again. As the time from one new moon to another, as astronomy teaches, is about 29½ days, a table of the new moons for 19 years may be very easily prepared. It is only necessary to observe that this lunar cycle always begins with a year of which the first new moon falls on the 1st of January, and that this was the case the first year B.C. Divide by 19 the number of the year plus 1, and the remainder will show what year in the lunar period the given year is. The number of the year is called the golden number. Besides these two cycles, which are indispensable for the calculations of the calendar, there are some others, several of them known by the names of periods. In China a cycle covers a period of 60 years; hence the poet, Moore, may have had in mind a definite length of time when he used the expression, "A cycle of Cathay."

Cycloid, the curve generated by a point in the plane of a circle when the circle is rolled along a straight line and always in the same plane. Imagine a circle, D E H B, which is



rolled along a straight line A D *a* in the plane of the circle itself till the point first at rest is brought to rest again, after an entire revolution. The curve A F G B *a* thus described by this point is called a *cycloid*. The circle DEB is called the generating circle; the line A D *a* on which it is described, the base of the cycloid. The length of the cycloid is four times the diameter of the generating circle, and its area three times the area of this circle. This line is very important in the higher branches of mechanics. Imagine a pendulum C B suspended by a thread in such a way that in the swinging of the pendulum between two cheeks C A, C *a*, each of which is bent in the form of a semicycloid equal to the semicycloid A F G B, the thread rolls and unrolls itself. Then the bob of the pendulum will describe the curve A F G B *a*, and the longest vibrations will be performed in the same time as the shortest, producing isochronism. The cycloid is hence called an isochrone. It is also called brachistochrone or line of swiftest descent; because it is the line in which a heavy body, falling in a direction oblique to the horizon, would pass in the shortest time between two points.

Cycloid Fishes, an order of fishes, according to the arrangement of Agassiz, having smooth, round, or oval scales, as the salmon and herring. The scales are formed of concentric layers, not covered with enamel and not spinous on the margins; they are generally imbricated, but are sometimes placed side by side without overlapping.

Cyclom'eter, an invention for measuring and recording the distance traveled by wheeled vehicles, extensively used in cycling. Its most important application is in railroading. The apparatus is connected with the wheels of a car, and by recording the number of revolutions tells on a sheet of paper inside the car the number of miles traveled. It is purely automatic, and in addition, by an attachment of extreme beauty and ingenuity, every inequality in the road-bed of a railroad is detected and located.

Cyclone (Gr. "whirling," "revolving"), a term originally applied to the violent rotatory tempests of the tropical and sub-tropical regions, called in the West Indies hurricanes; in Senegal, tornadoes; at the Cape of Good Hope, trovados; in the Chinese Sea, typhoons; and on the west coast of Central America, papagallos. The diameter of rotation of such storms is from 200 to 300 miles and sometimes exceeds 500, and the velocity of the wind, according to Humboldt, is sometimes as much as from 200 to 300 miles an hour. The centre of the storm often advances 30 miles an hour. Since the discovery of the rotatory course of winds even at a distance from the tropics the term cyclone has, however, been applied to any system of winds blowing round a centre of low pressure, and a cyclone is distinguished from an anti-cyclone, which is a system of winds with a centre of high pressure. These two system are always in proximity to one another, though their centres may be, and usually are, very wide apart. In the cyclone there is a gradual rise of barometric pressure from the centre to the circumference, in the anti-cyclone a gradual fall; in consequence of this the tendency of the winds in a cyclone is toward the centre, in an anti-cyclone it is from the centre; a cyclonic system travels in a certain direction from the region where it originates till it is dissipated or destroyed; an anti-cyclonic system generally remains in the region where it is formed, its centre only shifting about within comparatively narrow limits; the isobaric lines of a cyclone, especially near the centre, are almost circular, those of the anti-cyclone extremely irregular, and the atmospheric gradient (that is, the rate of increase or decrease of pressure) is usually greater in the former than in the latter. While the general tendency of cyclonic winds is toward the centre of the cyclone, their actual course is not directly toward that space, but spirally round it, the lines of rotation being nearly the same as those of the isobaric curves. The direction of rotation is stated in 'Buys-Ballot's Law of the Winds,' which in one of its forms is: "Stand with your back to the wind, and the barometer is lower, in the northern hemisphere, on your left hand than on your right; in the southern hemisphere, on your right hand than on your left." There are important differences in the weather accompanying cyclones and anti-cyclones, but these are so much modified by local circumstances that it is impossible to enter upon them here. Almost the only general observation that can be made on this head is that the air in a region over which an anti-cyclone hovers, especially near the centre, is very dry, and either clear or almost free from clouds. The great cyclonic area of the United States is the central Mississippi valley, notably Kansas. They are less common apparently on the east side of the river and less violent, but occur with some frequency as far east as the Alleghanies.

Cyclopædia. See ENCYCLOPÆDIA.

Cyclopean (sī-klō-pē'an) **Works,** in ancient architecture, masonry constructed with large blocks of stone unhewn and uncemented, said to be the works of a fabulous race of giants, the Cyclopes (q.v.) Some of these works were the walls of Argos, Tiryns, and Mycenæ. Similar walls are to be found in various parts of Greece, Italy, and Sicily, at Persepolis and elsewhere in Asia, and at Cuzco, Peru.

Cyclópes, sī'klō-pēz, a race of giants in the mythology of Greece. The earlier mythology makes them the sons of Uranus and Ge (Heaven and Earth). They belonged to the Titans, were three in number — Arges, Steropes, and Brontes — and had only one eye, situated in the middle of their forehead. They were cast into Tartarus by their father, and again by Cronus, but being released by Zeus provided him with thunderbolts, and became his ministers. They were slain by Apollo for having furnished Zeus with thunderbolts to kill Asclepius. Wholly different from these are the sons of Neptune, of whom Polyphemus was the chief. They are described in the Odyssey (ix. 106, et seq.) as uncouth giants, supporting themselves by the breeding of cattle. According to Homer they resided on the west side of Sicily. A later tradition describes the Cyclopes as the servants and assistants of Hephaistus (Vulcan), engaged in making the armor and metal ornaments for gods and heroes. The name Cyclopes is also given to a Thracian tribe of giants, who according to tradition built the stone works known as cyclopean (q.v.) They were named from their king Cyclops.

Cyclops, sī'klŏps, a genus of small fresh-water crustaceans, type of a family (*Cyclopidæ*) in the order *Copepoda* (q.v.). They are popularly included under the wide title of "water-fleas." Various species are common as active swimmers in fresh-water pools or slow-flowing brooks, and a few forms have been recorded from the sea. The head-region is not distinct from the first ring of the thorax; there is a pear-shaped segmented body and a long abdomen; both pairs of antennæ are long, and in the male the anterior pair form claspers. The average length of the commonest species is from two to three millimetres; the males are generally smaller than the females. A very marked feature, to which the name refers, is the single medium eye, usually bright crimson and sparkling like a gem; and not less noticeable are the two large egg-bags carried by the females. They eat both animal and vegetable matter, and are very prolific.

Cyclora'ma, a painted conspectus of a scene arranged in a circular room, so as to afford the eye a single comprehensive view. Battles have been thus presented in the United States in the form of circular panoramas, as that of Gettysburg. See PANORAMA.

Cyclostomi, sī-klŏs'to-mī (Gr. "round-mouthed"), one of the five primary divisions or classes of the craniate *Vertebrata*, also called *Agnatha, Marsipobranchii*, etc. Excluding the doubtful extinct ostracoderms, the cyclostomes have an imperfect, embryonic brain case, no lower jaw, no paired limbs or their supporting girdles, no ribs and no scales. The skeleton

is purely cartilaginous and the notochord persists in living forms. There are many remarkable structural specializations in the representatives of the three or four subdivisions, and the peculiarities of the living forms are such as to indicate that they are survivals of a once extensive group of fish-like animals; but only a single species of fossil can be referred to here with certainty. The following may be indicated as orders: *Cyclostomata*, with the vertebral column well developed, like other parts of the internal skeleton, ossified; no external skeleton and no paired limbs; the tail provided with a large diphycercal fin supported by rays; the skull a cartilaginous capsule, with prominent ear sacs, and a large median nasal sac with a circle of cirri about its orifice; this group is represented by a single species (*Palæospondylus gunni*), from the Devonian rocks of Scotland; *Hyperotreta*, having the internal skeleton entirely unossified, with a persistent notochord and no vertebræ; body eel-like with a caudal fin; the mouth a suctorial disk, with the rasping end of a piston-like tongue appearing at its centre; the nasal sac median and its diverticulum not penetrating the palate; and seven pairs of pouch-like gill slits, which communicate with a common respiratory tube distinct from the œsophagus; represented by the single family, *Petromyzontidæ*, with the principal genera *Petromyzon* (lamprey, q.v.), *Lampetra*, *Mordacia* and *Geotria*; and *Hypercotretia*, like the last in the characters enumerated except that the nasal diverticulum (*hypophysis*) perforates the palate and opens into the mouth and there is no separate internal respiratory tube. There are two families of this group, the *Bdellostomidæ*, with 6 to 14 gill pouches on each side opening separately at the surface; and the *Myxinidæ*, with the single genus *Myxine* (hag fishes, q.v.), in which the six pairs of gill pouches have a single common external opening on each side. To these Prof. Cope has added the great extinct group *Ostracophori* (q.v.).

Cydias, sĭd'ĭ-as, Greek painter; b. the island of Cythnus, one of the Cyclades. Hortensius, the orator, purchased his painting of the Argonauts for 144,000 sesterces (nearly $7,200). This same piece was afterward transferred by Agrippa to the portico of Neptune.

Cyd'nus, a river of Cilicia, rising in the Taurus, and flowing through Tarsus into the Mediterranean Sea. The mouth of the Cydnus is often choked with sand and other alluvial deposits.

Cydonia (named, it is believed, from a place called Kydon, in the island of Crete, of which this fruit is a native); a genus of fruit trees, order *Pomaceæ*. It has leafy calyx lobes, and many-seeded cells in its fruit. *C. vulgaris* is the quince; *C. japonica* is an ornamental shrub. See QUINCE.

Cygnus, sĭg'nŭs ("the Swan"), one of Ptolemy's northern constellations. It includes the double star Albiero, the components of which are differently colored, one of them being orange and the other blue. The motions of the double star, 61 Cygni, have been carefully observed, and it has been estimated that the pair together weigh about one third as much as our sun.

Cylinder, the name of a geometrical solid formed by two parallel circular surfaces, called the superior base and the inferior base, and a convex surface terminated by them. There is a distinction between rectangular cylinders and oblique cylinders. In the first case, the axis, that is, the straight line joining the centres of the two opposite bases, must be perpendicular to them in the second, the axis must form an oblique angle with each base. The cubic contents of a cylinder are equal to the product of the base by the altitude. Archimedes found that the solidity of a sphere inscribed in an equilateral cylinder, that is, of a sphere whose diameter is equal to the height and also to the diameter of the base of the cylinder, is equal to two thirds of the cubic contents of the cylinder. A right circular cylinder may be defined as the solid generated by the revolution of a rectangle about one of its sides.

Cylindrical Lens, a lens whose surfaces are cylindrical instead of spherical, which is usually the case. A convex cylindrical lens brings the image of a source of light to a focus in a line instead of in a point. These lenses are employed in spectroscopes for examining star-spectra. They are usually planocylindrical; that is, cylindrical on one side and flat on the other.

Cylindroma. See TUMOR.

Cylon, an Athenian leader who, with the intent to make himself tyrant of Athens, occupied the Acropolis, and being reduced by a blockade, was put to death by Megacles, in violation of his oath to spare him.

Cyma, sī'ma, in architecture, a wavy molding the profile of which is made up of a curve of contrary flexure, either concave at top and convex at bottom or the reverse. In the first case it is called a cyma recta; in the second a cyma reversa. It is a member of the cornice, standing below the abacus or corona.

Cymbals, among the ancients, musical instruments, consisting of two hollow basins of brass, which emitted a ringing sound when struck together. The instruments which are now used in military music, and have been borrowed from the East, seem to have taken their rise from these. They were used in the worship of Cybele, Bacchus, Juno and other deities.

Cymbeline, sĭm'bĕ-lĭn or sĭm'bĕ-līn, British king of the 1st century. Not very much is known of his career. Shakespeare's play of 'Cymbeline' was written about 1609. A few facts about Cymbeline and his sons the dramatist took from Holinshed's 'Chronicle,' but the story of Imogen forms the ninth novel of the second day of Boccaccio's 'Decameron.' These two stories Shakespeare has interwoven; and the atmosphere of the two is not dissimilar: there is a tonic moral quality in Imogen's unassailable virtue like the bracing mountain air in which the royal youths have been brought up.

Cyme, an ancient city of Æolia, which, although styled by Strabo the largest and noblest of Æolian cities, is of little historical importance. The father of Hesiod lived here before he migrated to Ascra in Bœotia.

Cyme, in botany, a mode of definite inflorescence in which the principal axis terminates in a flower, and a number of secondary

axes rise from the primary, each of these terminating in a flower, while from these secondary axes others may rise terminating in the same way, and so on. All the flower-stalks rise to nearly the same height, so that they resemble a compressed panicle.

Cymri, kĭm'rĭ, or **Kymry**, a branch of the Celtic family of nations which appears to have succeeded the Gaels in the great migration of the Celts westward, and to have driven the Gaelic branch to the west (into Ireland and the Isle of Man) and to the north (into the Highlands of Scotland), while they themselves occupied the southern parts of Great Britain. At a later period (during the 5th and subsequent centuries) they were themselves driven out of the Lowlands of Great Britain by the invasions of German tribes, and compelled to take refuge in the mountainous regions of Wales, Cornwall, and the northwest of England. A part of them also crossed over into Gaul, and settled in Brittany. Wales may now be regarded as the chief seat of the Cymri (a name which the Welsh still give to themselves), as it is still the chief place where the Cymric dialect of the Celtic language is spoken. A variety of this dialect, called the Cornish, was at one time spoken also in Cornwall, and another variety, called the Armorican, is still spoken in some parts of Brittany. On account of the similarity of the name the Cymri have been identified both with the Cimbri and the Cimmerii, but the identification in both cases, especially the latter, is doubtful. The origin of the name is unknown.

Cynægirus, sĭn-ē-jī'rus, Athenian hero, brother of Æschylus. At the battle of Marathon he lost his hands in attempting to prevent a Persian ship from being pushed off, and then seized the gunwale with his teeth.

Cynanchum, sĭ-năn'kŭm, a genus of *Asclepiadaceæ*, of which some species have been used medicinally, as *C. monspeliacum*, a violent purgative, the so-called Montpellier scammony, and *C. vincetoricum*, formerly in repute as an antidote to other poisons. The Indian *C. extensum* yields fibre, and the *C. ovalifolium* of Penang, caoutchouc.

Cyn'ara, a small genus of compositæ, in many respects like the thistle. The two best-known species are the artichoke (*C. scolymus*) and the cardoon (*C. cardunculus*). Both are hardy perennials, found wild in southern Europe and northern Africa. The flowers are sometimes used to curdle milk. See ARTICHOKE; CARDOON.

Cynewulf, kĭn'ĕ-woolf, Anglo-Saxon religious poet. His name is only known from its being given in runes in the poems attributed to him, namely: 'Elene' (Helena), the legend of the discovery of the true cross; 'Juliana,' the story of the martyr of that name; and 'Crist' (Christ), a long poem incomplete at the beginning. The name Cynewulf also occurs as the solution of one of the metrical riddles in the Anglo-Saxon collection. Other poems, the 'Andreas,' the 'Wanderer,' the 'Sea-farer,' etc., have been ascribed to him without sufficient grounds. Cynewulf probably lived in the first half of the 8th century. From his poems we may gather that he spent the earlier part of his life as a wandering minstrel, devoting the latter to the composition of the religious poems connected with his name.

Cynics, a school of philosophers founded by Antisthenes, a scholar of Socrates, at Athens, about 380 B.C. This philosophy was a one-sided development of the Socratic teaching by Antisthenes and his followers, who looked only to the severer aspect of their master's doctrines, and did not see or did not rightly appreciate the way in which the seeming severity of the teaching of Socrates was corrected by the genial character of the man himself. An equally one-sided attention to the other aspect of the practical philosophy of Socrates, as exhibited in his own life, gave rise to the opposite teaching of Aristippus and his followers. There were, nevertheless, some noble features in the doctrines of the Cynics. They made virtue to consist in self-denial and independence of external circumstances, by which, as they thought, man assimilates himself to God. This simplicity of life, however, was soon carried so far by the Cynics that it degenerated into carelessness, and even neglect of decency. In their attempts at living conformably to nature they brought themselves down to the level of savages, and even of brutes. No wonder, then, that the Cynics soon became objects of contempt. The most famous of their number were, besides their founder, Diogenes of Sinope (412 to 323 B.C.), Crates of Thebes (about 328 B.C.), with his wife Hipparchia, and Menippus (about 60 B.C.), who was the last of them. After him this philosophy merged in the Stoic, a more worthy and honorable sect. See CYRENAICS.

Cynips, the gall-fly; a genus of insects belonging to the order *Hymenoptera*, the suborder *Petiolata*, section *Parasitica*, and family *Cynipidæ*. They are a kind of small flies remarkable for their extremely minute head and large, elevated thorax. The females are provided with an ovipositor by which they make holes where they deposit their eggs in different parts of plants, thus producing those excrescences which are known as galls. In these excrescences the small larvæ are produced, which live there either singly or several of them together for five or six months, and consume the interior for their nourishment. Some of the species undergo their transformations before leaving the excrescences, others quit them and bury themselves in the earth, to undergo their transformations there. The *C. gallotinctoria* is of a pale fawn-color, and lives on a species of oak which grows in the Levant, where it produces the so-called gall-nuts, which yield a black coloring matter, and are used in the making of ink. The *C. rosæ*, or bedeguar gall-fly, produces the hairy excrescences which are seen on the rose-bush and the sweet-brier. It is black, with the exception of the feet and the abdomen, which are red. The *C. psenes* is used in the Levant for caprification, an operation intended to hasten the maturity of figs. (See CAPRIFICATION.) Some species of gall-flies, such as the *C. fulviceps* and the *C. quercus-inferus*, have in some cases been produced from aphides instead of in the ordinary way from galls.

Cynocephalus, sī-nō-sef'a-lŭs (Gr. "dog-head"), a genus of monkeys including the various species of baboon (q.v.).

Cynodictis, sī-nō-dik'tis, a genus of primitive *Canidæ* (see Dogs, Fossil) of the Oligocene Epoch in Europe and America, a collateral ancestor of the modern dog family. It was of weasel-like proportions, with long tail, small brain, civet-like teeth and other primitive characters. Most of the species were small.

Cynodon Dactylon, Capriola Dactylon, Bermuda or **Bahama Grass**, a low, creeping, perennial grass found in most warm and tropical countries, where from its drought-resisting capacity it is used as a common pasture grass. It has delicate leaves and upright, leafy flowering branches which bear three to seven slender divergent spikes. Three of the four species are Australian. In the United States it is dispersed from Pennsylvania to Florida and westward to Texas and California, being hardy from Philadelphia southward. It grows freely on poor, sandy soils, but the leaves are short; on good soil it will grow one or two feet high. It will grow on almost any soil, if not too wet. Its root-stock runs readily, thus making it a valuable grass for binding drifting sands and for holding embankments liable to wash. Being insensible to heat and drought it soon makes a fine sod equally useful for grazing or for a lawn. It is also used for hay and is in bloom from April to October. It will not grow in the shade and it is easily injured by low temperatures, turning brown with the first frosts. It rarely bears seed, except in the extreme Southern States. The usual method of propagation is to chop up the roots, sow them broadcast and plow in, shallow. Once introduced it is hard to get rid of, but it has been eradicated by constantly plowing the land every week or so, or growing oats, followed by cowpeas in rows, which could be cultivated. Its rhizome is used in medicine, as a substitute for sarsaparilla. The plant is a favorite food of the wild goat, hence the name *Capriola*.

Cynoglossum, hound's-tongue, a genus of plants of the natural order *Boraginaceæ*, consisting of about 75 species of coarse herbs of wide distribution in temperate climates. The flowers form scorpioid racemes, as in the allied comfrey and forget-me-not, and are of a reddish color. Five species are found in America, the best known being hound's-tongue *C. officinale*). This genus is found in waste places from Quebec to Minnesota, and south to Kansas and North Carolina. It has a disagreeable smell like that of mice, and was at one time used as a remedy for scrofula. It is a troublesome weed, native in Europe and Asia. Another well-known species is *C. virginicum*, wild comfrey, which grows from New Brunswick south to Florida, and west to Louisiana and Kansas.

Cynomo'rium, a genus of parasitic plants, the best-known representative of which is *Cynomorium coccineum*, a fungus-like plant, found in the islands of Malta and Gozo. It was long known as *Fungus melitensis*, and enjoyed the highest reputation as a styptic, besides being used as an astringent in dysentery and other maladies. These uses, however, depended on the doctrine of signatures alone, its scarlet color and blood-like juice being interpreted as providential indications of its curative destination for all injuries or diseases accompanied by bleeding. It was jealously guarded by the Knights of Malta.

Cynosarges, sī-nō-sär'jēz, in ancient Athens, originally the name of a sanctuary of Hercules and a gymnasium in the east of the city, afterward extended to the suburb of Athens surrounding the gymnasium. It was in this gymnasium that Antisthenes, the founder of the Cynics, taught.

Cynoscephalæ, sĭn-ŏs-sĕf'ą-lē (Gr. signifying dogs' heads), the name of a range of hills in Thessaly, memorable for two battles fought there in ancient times. The first was 364 B.C., between the Thebans and Alexander of Pheræ, in which Pelopidas was slain; and the second, 197 B.C., in which the last Philip of Macedon was defeated by the Roman consul Flamminius.

Cynosure, sīn'ō- or sī'nō-shūr, or **Cynosura**, an old name for the constellation of the Little Bear or Ursa Minor, which contains the pole star in the tip of the tail. Cynosure, in a figurative sense, is hence used as equivalent to something which attracts general attention or draws all eyes toward it. The word literally means dog's tail.

Cynosu'rus, a genus of grasses. See Dog's-tail Grass.

Cynthia, the moon; a surname of Artemis or Diana, the moon goddess. In mythology Mount Cynthus, on the island of Delos, is said to have been the birthplace of Diana.

Cynthiana, sĭn-thĭ-ā'nạ, Ky., city, county-seat of Harrison County, on the south fork of the Licking River and on the Kentucky Central Railroad; 33 miles northeast of Lexington. It is a trade centre for farming and stock raising, and is the seat of Harrison Female College. It has carriage, plow, and cigar factories, distilleries (noted for their Bourbon whiskey), good schools, public library, two national banks, and several newspapers. Pop. (1900) 3,257.

Cynthius, surname of Apollo, the sun god, from Mount Cynthus, on the island of Delos, at the foot of which he had a temple, and on which he was born. Diana, his sister, is called Cynthia.

Cyperaceæ, sī-pē-rā'sē-ē, a natural order of monocotyledonous plants including 2,000 species. These herbaceous plants generally grow in moist places on the margins of lakes and streams, with a cylindrical or triangular culm with or without knots; the leaves are sheathing. The order comprises the genera *Carex*, *Scirpus*, *Cyperus*, *Schœnus*, *Mariscus*, *Papyrus*, and others.

Cyperus, sī-pē'rus, a genus of perennial herbs of the natural order *Cyperaceæ* (q.v.). The numerous species which are natives of tropical and temperate climates are characterized by having rootstocks or tubers, grass-like leaves, simple stems sparsely leafy below, perfect flowers in small compressed spikes which are arranged in compound umbels with numerous more or less attenuated bracts which have suggested the popular names umbrella plant and umbrella palm, which are perhaps most frequently given to *C. alternifolius*. This species is a very popular window garden and greenhouse plant, native of Madagascar. It is readily propagated by means of seed or by division of the larger plants and is easily cultivated in any good potting soil kept moist. It does best in a moist atmosphere. Many of the species are troublesome weeds in cultivated fields; some

are useful for food, their underground parts being starchy and mucilaginous; the tubers of others are used in perfumery. The chufa (*C. esculentus*) is valued in the Southern States for its tubers, upon which swine thrive well. Papyrus (q.v.) is the product of *C. papyrus*. Some species have been used in medicine but are now rarely employed.

Cy-près, sē prā (Fr. "as near," namely, as possible), the principle in the American and English law whereby a gift legal in form, which cannot be administered exactly as the testator specified, or which is not definitely specified, may be applied as nearly as possible like what was intended by the donor. In the United States the majority of cases wherein the cy-près doctrine is applied comes under charitable bequests on gifts for the advancement of education. In the United States it is held that the equity courts cannot make valid charities which are uncertain, but where charitable trusts have once been in part administered as directed by the testator, such action will prevent the trust from being defeated by change of circumstances. Where only a general charitable intention is expressed, as, relief of the poor, aid for the injured, under the cy-près doctrine the court of chancery may direct the disposal of the gift to some form of charity "as nearly as possible" like that mentioned or indicated by the testamentary gift of the testator. The laws based on the cy-près doctrine vary in different States. For further ways in which the cy-près doctrine is applied see ESTATE; FEE TAIL.

Cypress, the popular name for members of the genus *Cupressus* and for certain species of the related genera, *Taxodium* and *Chamæcyparis*, all of which belong to the natural order *Coniferæ*. There are about a dozen species of *Cupressus*, which are trees or sometimes shrubs with small aromatic, evergreen opposite leaves and tiny monœcious solitary flowers, the pistillate developing into almost globular cones containing numerous seeds which mature the second season. The best-known species is probably the common European cypress (*C. sempervirens*) which has been introduced into the United States. It is a stately tree of about 80 feet, of remarkable longevity, and of wide utility principally on account of its remarkably durable wood, which is highly resistant to the attacks of insects. It is yellowish or reddish, hard and dense and is used in cabinet work and in the making of musical instruments. Some writers believe it is the "cedar" and also the "gopher" wood mentioned in the Bible. *C. tortulosa* is probably the tallest species; it is a native of the Himalayas and attains a height of 150 feet. The hardiest species and perhaps the one most frequently planted is *C. macnabiana*, a bush with several small trunks or a small, dense, pyramidal tree of about 20 feet. It is a native of California, where it is very popular in private grounds and public parks. Another popular Californian species is *C. macrocarpa*, generally known as the Monterey cypress. It usually grows about 40 feet tall but occasionally nearly doubles that height. It thrives well even upon poor soils and makes a rapid growth under favorable conditions, but is more susceptible to frost than the preceding species. Numerous horticultural varieties of diversely colored foliage, and varying habit and height have been developed. *C. funebris*, a native of China, ranks about with the last-mentioned species in hardiness, rather excels it in height and is frequently planted on account of its wide-extending, pendulous branches and twigs. The cedar of Goa (*C. lusitanica*) is of unknown habitat but is frequently planted in southern Europe.

The bald or deciduous cypress (*Taxodium distichum*, formerly called *Cupressus disticha* and *Schubertia disticha*) is one of the most valuable of American timber trees, its straight and close-grained, soft, brown wood being highly esteemed where exposure to moisture is expected and where durability but not great strength is demanded. It is very largely used in greenhouse construction. Its range is from Delaware to Missouri and southward to the Gulf States and is especially abundant in swamps, but will thrive with a more or less noticeable change of habit in dry ground. It is a highly ornamental tree often 150 feet tall and sometimes more than 10 feet in diameter, with buttressed trunk, brown, flaky bark, erect or spreading branches bearing narrow light green leaves, purplish staminate flowers and nearly globular cones. The spread of the branches in old specimens is often more than 80 feet. It has developed a large number of horticultural varieties and is very popular as a park tree as far north as New York, about its northern limit of hardiness. In the southern swamps the trees develop "knees" from their roots. These knees, which are sometimes 10 feet tall, are supposed to act as aërators, but their function is not definitely known. When fully developed their tops are above high-water level.

The species of *Chamæcyparis* best known as cypress are *C. obtusa*, the hinoki cypress, and *C. pisifera*, the Sawara cypress. *C. lawsoniana*, the Orford cedar, was formerly known as *Cupressus lawsoniana*. It is a native of the Pacific coast States; the other two are natives of eastern Asia. They attain heights of about 100 and 120 feet respectively, have developed numerous horticultural varieties and are frequently planted in parks for their ornamental foliage and graceful habit of growth. See CEDAR.

Cypress Vine. See IPOMŒA.

Cyprian, sĭp'rĭ-ạn, **Saint (Thasius Cæcilius Cyprianus),** African bishop, martyr and one of the fathers of the Church: b. about 200; d. Carthage 14 Sept. 258. He was of patrician parentage, and inherited a considerable estate. Having received the highest education he professed rhetoric with eminent success in Carthage and in his school held disputations with representatives of the schools of philosophy and with believers in the Christian religion, with the result that he applied for admission in the Church. Shortly after being baptized (246) he was ordained priest and then was elected by the Christians of Carthage to be their bishop (248). In the persecution of the Christians by Decius (249–51) he prudently withdrew from Carthage and lived in concealment, but on the accession of Gallus (251-3) he returned to his see. There had been lively controversies among the churches over the question of readmission to the Christian communion of those who in times of persecution had renounced the religion of Christ; churches in Asia Minor and churches in Africa, among them the church

of Carthage, had in synods and in the letters addressed by their bishops to other bishops, strongly condemned the practice of some churches, among them that of Rome, in accepting as valid the baptism conferred by heretics. On the question of readmitting the *lapsi* to communion Cyprian favored leniency: he would readmit the fallen on proof of sincere repentance. But he would not acknowledge the validity of baptism conferred by an heretical minister. On this point he was at variance with the tradition and practice of the Church of Rome, and in support of his view he sent to Pope Stephen the acts of a synod of Carthage in which the invalidity of baptism conferred by heretics was declared. Pope Stephen replied that the tradition of the Church was opposed to this and bade Cyprian not to innovate, but to recognize as true and valid baptism administered by heretics if given in the name of the Trinity. Firmilian, a contemporary, states that Stephen threatened Cyprian with excommunication. To the threat the bishop of Carthage replied with great heat, but in the entire controversy on rebaptism he never calls the authority of the Pontiff in question, although he laments what he calls the injustice of the decision. In this controversy the final decision of the Roman Catholic Church was in favor of Stephen: that decision was rendered in the Council of Arles (314) and in that of Nice (325). In the reign of Valerian a new persecution of the Christians was decreed, and Cyprian being arrested and brought before the proconsul refused to sacrifice to the gods and was beheaded 14 Sept. 258; his day in the Roman calendar is 16 September, which day he shares with Pope Saint Cornelius.

Cyprinidæ, sĭ-prĭn'ĭ-dē, a family of fishes (the minnows) of the order *Plectospondyli.* The body is covered with cycloid scales, the head naked; the mouth is toothless and the maxillary bone does not enter its margin; the lower pharyngeal bones are large, elongated and bear one, two, or three series, of a few teeth each; the dorsal fin is short and there is no adipose fin. The intestine is usually normal, but one genus (*Compostoma*) is unique in having its coils passed around the swim bladder. The number of genera and species is estimated at 200 and 1,000 respectively, and in point of numbers they are the most important fresh-water fishes of Eurasia and North America, swarming in every brook, river, and pond. Some of the Old World species reach a large size but the American ones are mostly very small, only a very few ever exceeding a foot in length. They have little importance commercially, but are vastly important in nature, as they furnish the food supply of larger fishes, many birds, etc. Sexual dimorphism is very generally displayed during the breeding season in the spring, when the males become ornamented with epidermal warts and tubercles on the head and elsewhere, and their fins become bright red, yellow, or silvery. Thirty-five genera and about 250 species are recorded by Jordan and Evermann as belonging to the North American fauna. Among them are the different varieties of minnows, dace, shiners, chub, and roach (qq.v.).

Cyprinodon'tidæ (Gr. "carp-toothed"), a family of fishes, order *Malacoptera,* sub-order *Abdominalia.* Although the dentition of the family resembles that of the carp the jaws are more retractile and toothed. *Fundulus* is the most prominent genus of the family.

Cypripedium, a genus of plants of the natural order *Orchidaceæ.* The genus has about 30 species, 10 of them occurring in North America, and known generally as lady's-slippers. In medicine the term is applied to the rhizomes and rootlets of several species of *Cypripedium.* The root contains a volatile oil, tannic and gallic acids, and is used as a mild antispasmodic, for much the same purposes as valerian.

Cy'pris, a fresh-water crustacean, typical of the *Cyprida,* of the order *Ostracoda.* It is sometimes called water flea, and has an unsegmented body, seven pairs of appendages, a rudimentary abdomen, and a bivalve enclosing all. The shell is dainty and elastic; the posterior antennæ bear a long tuft of bristles on their second joint; the second pair of maxillæ have a small gill-appendage; and the posterior limbs are very irregular. *C. pubera,* the largest form, measures about one tenth of an inch. Some species, including *C. fusca* and *C. pubera,* reproduce by parthenogenesis in summer and autumn, the males being transient; while others, notably the *C. ovum,* the males are found throughout the year, and parthenogenesis seems not to occur. The eggs are usually laid in masses on stones and water-plants. The adults are said to be able to survive desiccation, and this is true of the eggs. Some species are very abundant as fossils in fresh-water strata.

Cyprus, an island under British control, lying south of Asia Minor, and the most eastern in the Mediterranean, near the mouth of the Bay or Gulf of Iskanderun. Stretching from southwest to northeast, it is about 148 miles long, with a width varying from 100 miles to 15 miles at a narrow peninsula in the north. Area 3,584 square miles. The main physical features of Cyprus consist of a range of mountains running along a large part of the northern coast, and a range parallel to it occupying a considerable part of the island on the south, with a broad tract of plain, called the Messaria, between, extending on either side to the sea. The second range culminates in Mount Troödos (6,406 feet). Cyprus is deficient in water, its streams being chiefly mountain torrents, which dry up in summer. The climate is in general healthy, excepting in various places during the heats of summer, which, causing a rapid evaporation, give rise to malarial fever. The forests were formerly very extensive, and in ancient times yielded wood much valued by the Phœnicians for ship-building, but owing to indiscriminate cutting, the depredations of goats, etc., they now cover a comparatively small area, with the result that the fertility of much of the soil has been impaired. The forests are now under government supervision, and eucalypti, pines, and other trees are being planted. Agriculture is in a rather backward state, but various vegetables are raised. The cultivation of the vine and the production of wine is increasing, most of it being sent to Egypt and France. Much mischief is sometimes done by locusts, but measures have been taken, under the supervision of the government, by

which their numbers have been greatly diminished in recent years. The extensive pasture lands of the island support numbers of sheep and goats. Cyprus possesses much mineral wealth, and in early times was celebrated for its copper, a metal the English name of which can be traced to that of this island. The copper is again being worked, as are also quarries of sandstone, marble, granite, limestone, etc. Salt in large quantities is obtained from works at Limasol and Larnaca. The sponge-fishery is of some importance. In addition to wine the chief articles of export are carobs, cotton, silk cocoons, cereals, raisins, skins, wool, cheese, and fruits. The imports are cottons and other manufactured goods. Education is being attended to by the government and about $22,000 is expended annually in government grants, three fourths to Christian and the remainder to Mosiem schools. There are five high schools and fully 300 elementary schools. Roads and telegraphs have been constructed throughout the island, but there are no railroads. Cables connect it with Syria and Egypt. About one fourth of the people are Mohammedans, the rest are mostly members of the Greek Church.

The Phœnicians established themselves in Cyprus about 1100 or 1200 B.C. Greek colonists followed later; and for a time it was under Assyria. The Phœnicians introduced the worship of Astarte, which afterward passed into that of the Greek goddess Aphrodite (Venus). Amasis brought the island under the Egyptian yoke, 550 B.C. In 525 B.C. it was subdued by Cambyses and annexed to the Persian empire, but it again became a dependency of Egypt under Ptolemy Soter toward the end of the 4th century B.C. In this condition it remained till the year 57 B.C., when it was made a Roman province. After the division of the Roman territories Cyprus continued subject to the eastern empire. In 1182 Isaac Comnenus, a prince of the imperial family of Constantinople, made himself independent, but the island was wrested from him in 1191, during the third Crusade, by Richard I. of England, who afterward bestowed it upon Guy of Lusignan on condition of his renouncing his claim to the title of king of Jerusalem. After the extinction of the legitimate male line of Lusignan, James, an illegitimate descendant, became the ruler. His wife was a Venetian (Catharine Cornaro), and as she had no children, at his death the Venetians took advantage of this circumstance to make themselves masters of the island (1489). They enjoyed the undisturbed possession of it till 1571, when, in the reign of Selim II., notwithstanding a brave resistance on the part of Marco Antonio Bragadino, who defended Famagusta 11 months, it was conquered by the Turks and annexed to the Ottoman empire. In 1830 it was taken by the viceroy of Egypt, but was retaken by the Turks in 1840, and retained by them till June 1878, when it was ceded to Great Britain by the Convention of Constantinople, concluded during the negotiations consequent on the Russo-Turkish war of 1877–8. It still nominally forms a part of the Turkish dominions, the agreement being that it should be administered by Great Britain so long as Russia should retain possession of Batoum and Kars. Great Britain was also bound to pay a subsidy to the Porte, which amounts annually to £92,868. It is not paid directly, however, but retained as an offset against British claims against Turkey. In 1882 a new constitution was framed by the British government for Cyprus. By this a legislative council consisting of 12 elected and 6 official members is appointed, and is presided over by the high commissioner. Of the 12 elected members 9 are Christians and 3 Mohammedans. The yearly budget is laid before the council, and no new tax is to be imposed or existing tax increased without the vote of the council. Control is, however, reserved from the council over such permanent charges on the revenue as the amount of tribute payable to Turkey, the salaries of the high commissioner, judges, the official members of the council, etc. To provide for special emergencies and matters of international concern, power is reserved to the British sovereign to legislate for the island by order in council. The island is divided into six districts, each presided over by a commissioner, and each having a district court. In recent years a vast quantity of interesting archæological objects have been found in Cyprus. Pop. about 300,000.

Cypsel'idæ. See SWIFT.

Cyrano de Bergerac. See BERGERAC, CYRANO DE.

Cyrenaica, sĭr-ē-nā'ĭ-ka, anciently a Greek state in the north of Africa, west of Egypt, comprising five cities (Pentapolis), among which was Cyrene, a Spartan colony. During the most flourishing period of the history of the city of Cyrene that town held in nominal subjection the whole of Cyrenaica, or the country lying between Carthage on the west, Egypt on the east, and Phazania (Fezzan) on the south, with the Mediterranean for its northern boundary. But the Greek colonists actually occupied no more than the elevated district in the north, now called Jebel Akdar, along with the adjacent coast. Cyrenaica remained independent at first as a monarchy under a dynasty of kings, the successors of Battus, who led the first colony to Cyrene, afterward as a republic, until it was subdued by Ptolemy, the son of Lagus, and annexed to Egypt 321 or 322 B.C. By the will of the last king of Cyrenaica belonging to the Ptolemaic dynasty, it was left to the Romans, 95 B.C., who, about 20 years later, erected it along with Crete into a Roman province. Under Constantine it was separated from Crete and made a province by itself. See CYRENE.

Cyrenaics, or **Cyrenians,** a sect of ancient philosophers, whose founder was a disciple of Socrates, being Aristippus, a native of Cyrene, in Africa, after which city his followers were called. His great maxim was, that a man ought to control circumstances, and not be controlled by them. He held that the sum of life was made up of pleasure and pain; the one to be sought after as good, the other to be avoided as evil. The chief good then, was the greatest number of agreeable perceptions; and the true philosopher the man who actively and successfully pursued pleasure. Every act was regarded as morally indifferent, and only to be viewed as it produced pleasure or pain to the individual. The chief successors of Aristippus were Theodorus, Hegesias, and Anniceris, each of whom became the founder of a sect known respectively as the Theodoran, Hegesian, and Annicerian schools. As cynicism was the forerunner of

stoicism, so cyrenaicism paved the way for epicureanism, which constitutes its chief merit.

Cyrene, si-re'ne, in Greek mythology, the daughter of Peneus, who was carried by her lover Apollo into Africa, and gave name to that part called Cyrenaica.

Cyrene, in ancient times a celebrated city and the capital of Cyrenaica, in Africa, about 10 miles from the north coast, founded by Battus and a body of Dorian colonists, 631 B.C. Numerous interesting remains have been discovered here, including a bath, two temples (supposed to be of the Roman period), and a magnificent necropolis, containing grottoes, façades, and monuments of various kinds. In one of the grottoes are several curious paintings. Cyrene was the birthplace of Aristippus, Carneades the philosopher, Eratosthenes, and Callimachus the grammarian. The town now occupying the site of the ancient Cyrene is a miserable place in the regency of Tripolis. See CYRENAICA.

Cyre'nius, a Greek form of Publius Sulpicius Quirinus, named in Luke ii. as governor of Syria. He received his appointment as governor in 6 A.D., but the difficulty in harmonizing this with Luke is obviated by admitting that he had been governor also at an earlier date — according to Zumpt, from 4 B.C. to 1 B.C.

Cyril, sĭr'il, **Saint**, patriarch of Alexandria, and one of the fathers of the Church: b. Alexandria 376; d. there June 444. He was patriarch of Alexandria from 412, when he succeeded to his uncle Theophilus in that station, till his death. He was a very zealous champion of orthodoxy and a fiery adversary of Nestorius, Eutyches, and all the heresiarchs and heresies of his time. So intemperate was his zeal for orthodoxy and for the extermination of dissent from the creed of Nicæa, Chalcedon, and Constantinople, that it has brought down upon him the animadversion of some modern Church historians and has given material for historical novels in which imagination fills in what was lacking in the portrait of Saint Cyril drawn by his contemporary adversaries. Among modern Protestant writers Dean Milman in his 'History of Latin Christianity' presses against him charges of barbarity, persecution, and bloodshed, on account of which Cyril, though styled saint, must be esteemed "one of the worst heretics against the spirit of the gospel." He is charged with having closed the churches of the Novations and seized their church property; with having with an armed rabble wrecked the synagogues and driven the Jews in thousands out of the city; with having excited such tumults that the authority of the governor of Egypt, Orestes, was for a time defied. The murder of the illustrious Hypatia, neo-platonist philosopher and adversary of the Christian Church, is not alleged to have been instigated by him, but it is regarded as the inevitable sequel to his violent acts and speeches; and the perpetrators of it were, it is alleged on the authority of contemporaries, "officers of his Church." It is further charged that he was attended at Ephesus, on the occasion of the council of the Church held there in 431, by a rabble of followers, presumably to overawe the fathers, over whom he himself presided: in that council he procured the condemnation of Nestorius, followed by deprivation and banishment by the emperor. The works of Cyril, in the edition published at Paris in 1638 (7 vols.) consist of commentaries, treatises, homilies, and epistles. Cyril holds high rank among the Church fathers as a theologian.

Cyrillus and Methodius, apostles of the Slavs. They were brothers, and natives of Thessalonica. Cyril was the name adopted as a monk by Constantine, b. 827. For his learning he was surnamed "the philosopher." The Khasars, a Tartar people, having about the year 860 asked the Emperor Michael III. to send them Christian missionaries, Cyril was sent and made many converts. The Bulgarians of Thrace and Mœsia were evangelized by Methodius, who baptized their king Bogoris in 861. At the request of Ratislav, Duke of Moravia, the brothers then turned to the countries on the March and Danube. They prepared a Slav translation of the Scriptures and chief liturgical books (which became the foundation of the literature of the Slavs), and by their services in the mother-tongue won the hearts of the people from the Roman missionaries. The two brothers were summoned to Rome to explain their conduct, in conducting services in the vernacular, and Cyril died there in 869. Methodius, who in the same year was consecrated bishop of the Moravians, completed the evangelization of the Slavs. Called to Rome in 879 to justify his celebration of the mass in the native tongue, he succeeded in gaining the approval of Pope John VIII., and (according to the most probable account) d. Hradisch on the March 6 April 885. Bohemia and Moravia celebrated the millenary festival of their two apostles on 5 July 1863. Both brothers are recognized as saints by the Roman Catholic Church. Their festival falls in the Roman Catholic Church on 9 March; in the Greek Church 11 May. The Cyrillic alphabet, modified out of the Greek by Cyril, superseded the more ancient Slavonic alphabet over a wide area. The history of Cyril and Methodius is still very obscure. See Ginzel, 'Geschichte der Slawenapostel Cyril und Method' (1857); Dümmler and Miklosich, 'Die Legende vom Heiligen Cyril' (1870).

Cyril of Jerusalem, Saint, Greek father of the Church: b. Jerusalem about 315; d. there about 386. After his ordination to the priesthood in 345 his special office was to instruct the catechumens, both those who were to be prepared for admission to the Christian communion through baptism and those who after baptism were to be inducted into knowledge of the mysteries of the Christian religion, especially the mystery of the Eucharist. This occupation led to his writing his book of 'Catecheses,' one of the most interesting monuments of the ecclesiastical literature of that time. He was made bishop of Jerusalem in 350. Twice he was deposed and sent into exile by imperial decree because of his unflinching zeal for the creed of Nicæa as against the Arian party, first in the reign of Constantine II. and then in that of Valens. On the accession of Theodosius in 379, he was restored to his see and there remained till his death. At the œcumenical council of Constantinople (381) he was received with acclamations by the fathers as a confessor of the faith who had gladly suffered persecution

for the truth's sake. His 'Catecheses,' or catechetical lectures are 23 in number, of which 18 are for the instruction of catechumens in the stage of preparation for baptism, while the remaining five, called the 'Catecheses Mystagogicæ,' treat, as their title imports, of the mysteries of the Christian religion. The work, translated into English, is one of the volumes of the Oxford 'Library of the Fathers.'

Cyrilla, a genus of shrubs consisting of one variable species, *C. racemiflora*, of the natural order *Cyrillaceæ*. The shrubs are found from the Carolinas westward to Texas and southward to Brazil. They are almost evergreen, and have attractive bright green leaves and white flowers in racemes. Popularly they are known as leatherwood and are sometimes seen in ornamental plantings as far north as New York, which is about the limit of their hardiness. They succeed best in moist, sandy soil and partial shade.

Cyrillian Letters, a kind of Slavonian alphabet, more properly called Kirillitsa, used in Russia, Servia, and Bulgaria, with some modifications. Tradition makes them the invention of St. Cyril in the 9th century, but modern research points toward the fact that the name was originally used of the rival alphabet, the Glagolitic or Glagolitsa. But the form now known as Cyrillian is much nearer the modern alphabet of the three Slavic peoples mentioned.

Cyrus, king of Persia: d. 529 B.C. The only ancient original authorities for the facts of his life are Herodotus and Ctesias. According to Herodotus he was the son of Cambyses, a distinguished Persian, and of Mandane, daughter of the Median king Astyages. He founded the Persian monarchy. A short time before his birth the soothsayers at the court of Astyages divined from a dream of his that his future grandson was to dethrone him. Upon this he gave orders that Cyrus should be destroyed immediately after his birth. For this purpose he was delivered to a herdsman, who, moved with compassion, brought him up, and named him Cyrus. His courage and spirit betrayed his descent to the king. The Magi having succeeded in quieting the uneasiness which the discovery occasioned him, he sent Cyrus to his parents in Persia, with marks of his favor. But Cyrus soon drew together a formidable army of Persians, and conquered his grandfather (559 B.C.), and thus became king of Media and Persia. In 546 he conquered Crœsus, the rich and powerful king of Lydia, and in 538 took Babylon after a siege of two years. He also subdued Phœnicia and Palestine, to which he caused the Jews to return from the Babylonish captivity. While Asia, from the Hellespont to the Indies, was under his dominion, he engaged in an unjust war against the Massagetæ — a people of Scythia, northeast of the Caspian Sea, beyond the Araxes, then ruled by a queen named Tomyris. In the first battle he conquered by stratagem, but in the second was defeated, and was himself slain (529 B.C.). The stories related by Xenophon in the 'Cyropædia' (professing to be an account of the life and character of Cyrus), that he received a splendid education at the court of Astyages, inherited his kingdom, and ruled like a genuine philosopher, are mere romance, Xenophon's design being to represent the model of a king, without regard to historical truth, and in this way perhaps to exhibit to his countrymen the advantages of a monarchy. The chief points in which the account of Ctesias differs from that of Herodotus are that Ctesias does not make Cyrus any relation of Astyages, that after the conquest of Media Cyrus married Amytis, the daughter of Astyages, and honored the latter as a father, and that he met his death in a battle with a nation called the Derbices, who were assisted by the Indians. Ctesias also mentions certain wars of Cyrus not related by Herodotus, and gives a somewhat different account of the war with Crœsus, king of Lydia.

Cyrus, called the Younger, king of Persia: b. about 424 B.C.; d. 401 B.C. He was the second son of Darius Nothus, or Ochus, and at 15 obtained the supreme power over all the provinces of Asia Minor. His ambition early displayed itself; and when, after his father's death (404 B.C.), his elder brother, Artaxerxes Memnon, ascended the throne, Cyrus formed a conspiracy against him, which was, however, discovered. Cyrus was arrested by his brother and condemned to death, but at the intercession of his mother Parysatis, was released, and made governor of Asia Minor. Here Cyrus assembled a numerous army to make war upon Artaxerxes and dethrone him. Being informed of his brother's design, Artaxerxes marched against him with a much larger army. In the plains of Cunaxa, in the province of Babylon, the two armies encountered each other (401 B.C.). In the battle that ensued the troops of Cyrus were at first victorious, but the fruits of the victory were lost through the death of Cyrus himself in the battle. An account of the life of Cyrus is contained in the opening book of Xenophon's 'Anabasis,' which gives a detailed account of the retreat of the Greek auxiliaries of Cyrus from the interior of Persia to the coast of the Black Sea.

Cys"tadeno'ma. See TUMOR.

Cysticercus, sĭs-tĭ-sĕr'kŭs, a larval stage of the tapeworm, sometimes found in the human body in the form of small-sized tumors, and which may be distributed in a variety of situations. The tumors may range from the size of a pea to that of a hazelnut, and may exist singly or may be multiple. They are found chiefly in the back and sides of the trunk, less frequently in the extremities, and are sometimes subcutaneous. Occasionally they involve the brain and other organs, as the liver, kidneys, spleen, etc. Frequently they give rise to no symptoms whatever, but when occurring in an important organ of the body may cause major symptoms. In the flesh of many of the lower animals cysticerci also frequently occur, and it is by those present in the meat which he eats that tapeworms are largely communicated to man.

Cystinu'ria, a condition in which large amounts of cystin are found in the urine. It is a very rare condition, and is usually associated with excessive intestinal putrefaction. Sometimes cystin calculi result because of the excess of this acid in the urine.

Cysti'tis, an inflammation of the urinary bladder, usually resulting in pain and increased desire to urinate. The urine may be cloudy or bloody, and there is usually an excess of mu-

cas and pus found. The pain is situated over the pubic bone and may extend to the back, and there may become associated fever with chills, if the inflammation is severe. Cystitis is most frequently due to an infection from without, usually the result of passing an unclean catheter. It may also result from urethritis, and is a very common complication in old men in whom the prostate gland is enlarged. It may also result from the presence of a stone in the bladder. Treatment is often difficult, requiring skilled medical attendance; but sitz-baths and hot applications to the abdomen are of service, and abstinence from peppery or alcoholic foods is advisable.

Cystoi'dea, an order of extinct echinoderms. They are spheroidal animals, pedunculate or sessile, enclosed by polygonal calcareous plates. They have a mouth above; the arms are rudimentary. Buch first elucidated their structure and affinities in an essay published at Berlin, in 1845, and gave them the name of *Cystideæ* in place of *Sphæronites*, which was their original appellation. Now *Cystideæ* has become *Cystoidea*. They range from the Upper Cambrian to the Silurian, being especially prominent in the Bala Limestone.

Cystop'teris, bladder-fern, a genus of delicate flaccid polypodiaceous ferns. They are found in moist, cool localities. Two are natives of Great Britain, *C. fragilis* (the brittle fern), common, and *C. montana*, very rare. The brittle fern has a wide range, being found within the Arctic circle to Chile, south Africa, and Australasia. They have dot-like sori covered by coral-like indusia.

Cysts, circumscribed tumors containing more or less fluid substance, or occasional gases, cut off from the neighboring tissues by a distinct limiting wall. See TUMORS.

Cy'tase, a ferment or enzyme that exerts a kind of digestive action upon the cell-walls of plants, rendering them soluble in water. It occurs in the hyphæ of certain parasitic fungi, and also in the germinating seeds of certain plants in which the reserve food-material is normally stored up in masses of stony hardness. It dissolves cellulose, but has no effect upon lignin, and is destroyed by exposure to a temperature of 150° F. The chemical nature of cytase is not yet established, and it may prove to be a mixture of several enzymes instead of a single substance of definite composition.

Cythere, si-thē'rē, a genus of *Entomostraca*, order *Ostracoda*, family *Cytheridæ*. The eye is single, the inferior antennæ setigerous, but without a tuft or pencil of tiny filaments; three pairs of feet are enclosed within the shell, and no heart is present.

Cytherea (from Cythera, a name for Venus), a genus of conchiferous mollusks belonging to the family *Veneridæ*. The shell is like that of the genus *Venus*. There are three cardinal teeth and an anterior one beneath the tunicle. The cythereas are in all seas; 176 recent species are known, and 200 fossil, the latter ranging from the Oölite down.

Cytisin, sī'ti-sin ($C_{11}H_{14}N_2O$). When the ripe seeds of laburnum are powdered, extracted with acidulated water, the fluid treated successively with lead acetate and tannic acid, and the precipitate, before it becomes resinous, mixed with lead oxide, then dried and exhausted with alcohol, crude cytisin is obtained on evaporation, and after proper purification it forms a brilliant crystalline mass. It is very soluble in water and alcohol, but insoluble in ether, benzol, and chloroform, has a bitter taste, but no odor. It is a very powerful base, decomposing the salts of ammonia and the metals even in the cold. It combines with the strong acids, but the salts are all deliquescent except the nitrate, which crystallizes very readily in splendid, thick, transparent, colorless, monoclinic prisms. It can be sublimed without decomposition by careful heating in a current of hydrogen. The poisonous properties of laburnum are well known. The toxicological effects are due to this alkaloid, which in doses of from 0.1 to 0.5 of a gram is fatal in a few minutes to ordinary small animals.

Cytisus, sī'ti-sŭs, a genus of low shrubs or small trees of the natural order *Leguminosæ*. There are about 40 species, natives mostly of Europe, western Asia and northern Africa. They are characterized by small, deciduous or evergreen trifoliate leaves, yellow, purple or white flowers in terminal or axillary racemes or heads, and few- to many-seeded pods. Several species with long twiggy branches are called broom; others are popularly known as laburnum and others by the genus name. A good many are cultivated for ornament either in shrubberies or in greenhouses, where some, especially *C. canariensis*, are known as genistas and are very popular about Easter time. In Europe several species are valued as forage plants, but in America they have not met the expectations of experimenters. See BROOM; GENISTA.

Cytode, sī'tōd, a piece or bit of protoplasm, defined by Haeckel as without a nucleus. In this respect it differs from a cell. The monera of Haeckel are cytodes which have not yet reached a cell-stage. At present, although the nucleus of some of the monera has not been detected, it is supposed that they may yet be found to be provided with it. A cytode is thus a provisional unit of organization.

Cytology, the science which deals with the structure, development, and functions of the cell; of the multiplication of cells and of the relations of cells to organs and tissues. It is distinguished from histology in that histology deals with tissues, while cytology deals rather with the cells of which tissues are composed. A sharp distinction cannot be made between cytology and morphology, although in general it may be said that cytology is concerned more with individual cells than with organs. Cytology may be called "oil immersion" morphology, because microscopes with very high magnifying powers are required for cytological studies. The terms, cytology and morphology, are used very indiscriminately by many botanists and zoologists. During the past 10 years, most botanical studies with such titles as "The Morphology of —," contain more or less cytology, while only a smaller number of articles purporting to be cytological, are largely morphological. Among the problems which belong indisputably to cytology are the following: The origin, development, structure, and functions of the cell and of its various constituents; nuclear and cell division; fertilization; organization of the embryo; the relation of the individual cell to cell complexes; the role of the cell in heredity.

An idea of the subject matter of cytology can best be gained by examining, from the cytological standpoint, a few prominent subjects which are also studied by investigators in other fields. See EMBRYOLOGY, FERTILIZATION, HEREDITY (*Cell*), etc.

The Cell.—A cell has been defined as "a mass of protoplasm with a nucleus in it." While this is true for many simple forms, there is in addition, in the vast majority of cases, a cell wall surrounding the protoplasm. (FIG. 1.)

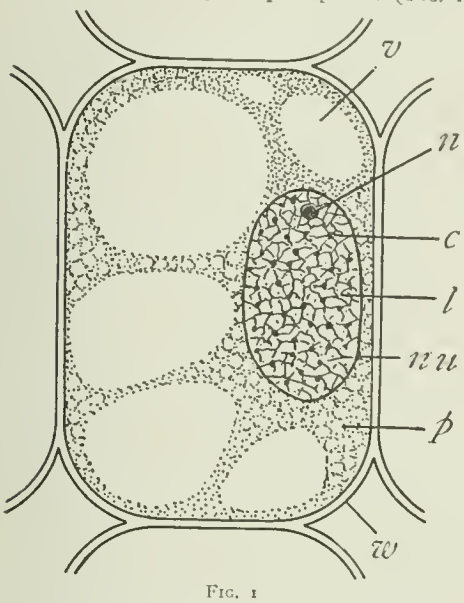


FIG. 1

FIG. 1.— A cell illustrating the parts which are common to nearly all cells. Highly magnified. *v*, vacuole; *n*, nucleolus; *c*, chromatin; *l*, linin; *nu*, nucleus; *p*, protoplasm; *w*, cell wall.

Cells without nuclei were reported frequently about 30 years ago, but at present no animal cells without nuclei are known. Numerous cases of non-nucleate cells were reported by the older botanists, but as lenses and methods of preparation have improved, nuclei have been demonstrated until the only doubtful cases now known to the botanist are the blue-green algæ and the bacteria.

Most cells are too small to be seen without a microscope, cells which are visible to the naked eye being rather exceptional. The egg of a bird consists of a single cell, as do the eggs of all animals and plants. The largest plant cells are the internodal cells of the stonewort, *Chara*, which reach a length of two inches. The largest egg cell described for any plant is that of *Zamia*, a plant related to the sago palm; this cell reaches a length of about one eighth of an inch.

The most usual shape of free cells is the spherical, and cells forming a part of a tissue are usually more or less rectangular in form.

When first formed, the cells of the individual animal or plant are very much alike, but as one examines cells farther and farther from the regions where active cell multiplication is taking place, it is seen that the originally similar cells are becoming very unlike. In the higher plants the outer cells become differentiated into protective tissue, the innermost into conductive tissue, others into assimilative tissue and still others become reproductive cells. In higher animals similar differentiations take place, cells which finally become so different, as those which form nerves, muscle, glands, and even the teeth, having been practically alike in the beginning. Among the unicellular organisms there is often a remarkable differentiation and division of labor, the single cell performing the functions of locomotion, securing food, respiration, digestion, assimilation, etc. Such differentiation and the causes which lead to it are among the most important of cytological problems.

It is a remarkable fact that while undergoing nuclear division, the cells of animals and plants strikingly resemble one another, even in the behavior of the most minute constituents of the nucleus and protoplasm. (FIG. 2.) This

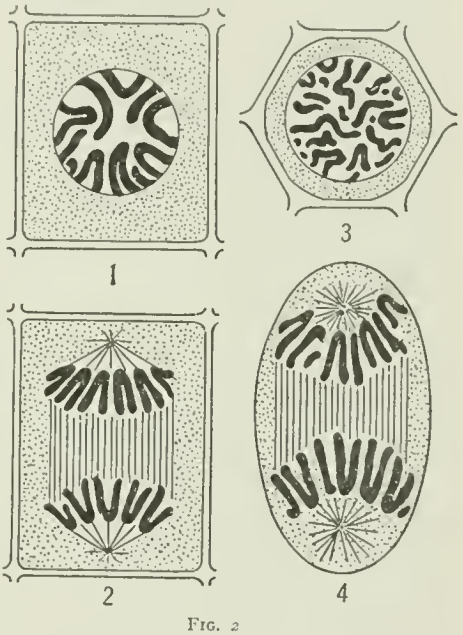


FIG. 2

FIG. 2.— Cells undergoing nuclear division: 1 an early and 2 a later stage in the division of the nucleus in a cell of the root tip of the common *Onion*. 3 and 4, the corresponding stages in epidermal cells of the *Salamander*. In 2 and 4 the V-shaped chromosomes, which are regarded as the physical basis of heredity, are clearly seen. Highly magnified.

must mean that animals have been derived from plants or that structures of amazing similarity have arisen independently in animals and plants.

Fertilization.—One of the most important problems of cytology is the problem of fertilization and attendant phenomena. While new individuals, even in the more highly organized plants and animals, may arise occasionally without fertilization (by parthenogenesis, chemical stimulus, vegetative multiplication, etc.), such cases are so rare that fertilization is assumed to occur unless its absence is definitely established. To the cytologist, fertilization consists in the union of definitely organized male and female elements. The cytological details of fertilization are essentially alike in plants and animals. (FIG. 3.) Fertilization, both in plants and in animals, is preceded by a reduction in the number of

chromosomes, so that the number of chromosomes found in the male nucleus or in the female nucleus is just one half the number which is found in the body cells of a given plant or animal. Consequently, when the two sexual nuclei fuse during fertilization, the number of chromosomes which characterizes the body cells

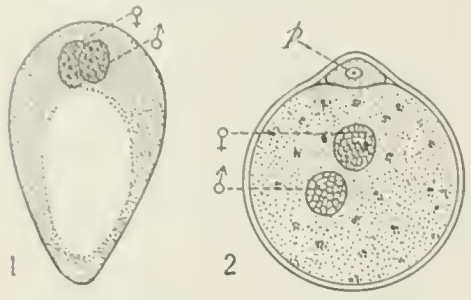


FIG. 3

FIG. 3. Fertilization. 1, the egg (oosphere) of a *Lily*, showing the male and female nuclei about to unite; 2, the egg of a *mouse* with the male and female nuclei about to unite; *p*, polar body. (2, after SOBOTTA.) Highly magnified.

is restored. The complicated details of the processes by which this reduction in the number of chromosomes is effected, are essentially alike in animals and plants. Those cytologists who have investigated most thoroughly the phenomena of fertilization have come to the conclusion that heredity is referable to a definite cytological basis.

A Cytological View of Heredity.—Almost without exception, cytologists believe that chromatin is the physical basis of heredity. The reasons for this belief are, briefly, as follows: The male and female parents are equally potent in transmitting characters to offspring; an equal amount of chromatin and an equal number of chromosomes are contributed by each parent; nothing but chromatin is contributed equally by the two parents. (FIG. 4.) There is usually a great difference in size between the male and female germ cells. The sperm cell (spermatozoan) of the ostrich is almost invisible to the naked eye, while the egg is as large as a cocoanut, and such differences in size are usual both in plants and animals. The egg contains a large amount of protoplasm and various foodstuffs, while the male cell contains very little protoplasm or foodstuffs and in many cases even that little is left outside at the time of fertilization, only the nucleus entering the egg. Hence, protoplasm and foodstuffs do not transmit hereditary characters. While the male nucleus is usually the smaller at the time of its entrance into the egg, it increases in size so that, at the time of fusion, the sex nuclei are alike in size. (See FIG. 3.) Investigators of this subject are usually tempted into speculative philosophy. Philosophizing over the facts is commendable, but the wild philosophizing in advance of the facts which has attended this subject, has been of little value, except as it has stimulated investigation.

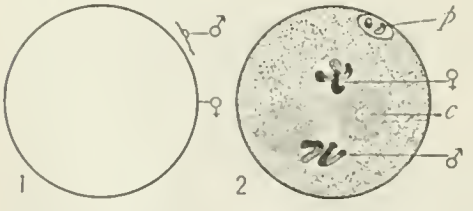


FIG. 4

FIG. 4.—1, The egg and sperm of *Fucus*, showing great inequality in size; 2, fertilization in a *worm* (*Thalassema*) showing the equal contribution of chromatin, each parent contributing two chromosomes. *p*, polar body; *c*, centrosome. (2 after BOVERI.) Highly magnified.

The organization of embryos and mature organisms from eggs is a cytological problem which has not yet been solved. The visible stages in development have been observed and described *ad infinitum*. Both experimental cytology dealing largely with living material, and anatomical studies of thin sections, stained so as to show the most minute details of structure, are contributing to the solution of the problem, but the fundamental causes underlying the phenomena are still unknown and seem as difficult of solution as the problem of the origin of life. The eggs of the sunflower and the willow, like the eggs of all flowering plants, are too small to be examined with the naked eye, but even when examined with the aid of modern technique and the most powerful microscopes, they present no essential differences in external appearance or internal structure, and yet one always develops into a sunflower, and the other into a willow. Within the fertilized egg are all the potentialities of the adult, even to the color of the flower or the markings on the wings of the butterfly. Some have believed that each part of the adult comes from a certain predetermined part of the fertilized egg. This is called the theory of germinal localization. Others have made experiments to show that this theory is not true. Most botanists and zoologists accept, as a working hypothesis, that chromatin is the physical basis of heredity, an hypothesis which assumes that there is no pre-localization in the protoplasm of the egg. The problem of organization is so bound up with that of heredity that much of the literature of the subject will be found in treatises on heredity.

References.—Cytology is too recent a subject to have given rise to many text-books, most of the literature being in the form of articles in leading botanical and zoological journals. Probably the most important book on the subject is Prof. E. B. Wilson's 'The Cell in Development and Inheritance.' The following headings of chapters in Prof. Wilson's treatise indicate quite accurately the subject matter of cytology as presented in the few universities which offer courses in this subject: (1) General sketch of the cell; (2) Cell division; (3) The germ cells; (4) Fertilization of the ovum; (5) Reduction of chromosomes, oogenesis, and spermatogenesis; (6) Some problems of cell organization; (7) Some aspects of cell chemistry and cell physiology; (8) Cell division and development; (9) Theories of inheritance and development. This book contains a very complete bibliography. Other books on the subject are: Hertwig's 'The Cell' and Hacker's 'Praxis und Theorie der Zellen und Befruchtungslehre.' All volumes cited above are by zoologists; no similar books have been written by botanists. A part of the subject is covered by Prof. Strasburger's

book on 'Reduktionstheilung, Spindelbildung, Centrosomen, und Cilienbildner im Pflanzenreich.' The chief scientific journals in which the great majority of cytological investigations are published are: (Botanical), 'Annals of Botany,' 'Botanical Gazette,' 'Jahrbücher für wissenschaftliche Botanik,' 'Berichte der Deutschen Botanischen Gesellschaft,' 'Flora,' and 'Annals des Science Naturelles Botanique,' (Zoological), 'Journal of Morphology,' 'La Cellule,' 'Anatomische Anzeiger,' 'Archives de Biologie,' 'Sitzungsbericht der Gesellschaft für Morphologie und Physiologie München,' and 'Bulletin Acad. Roy. de Belgique.'

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Cy'toplasm. See CELL.

Cyz'icus, Asia Minor, a peninsula 60 miles southwest of Constantinople. It projects into the Sea of Marmora, and is connected with the mainland by a narrow isthmus, but was once an island and the site of the ancient town of same name, which stood on its south extremity, and of which some remains, including a fine amphitheatre, are still seen. The peninsula, which stretches east to west for 18 miles, with a breadth of about 9 miles, is very beautiful and picturesque.

Czar, zär, **Zar,** or **Tsar,** tsär, the ordinary title of the emperor of Russia, derived from the Old Slavonic *cesar,* king or emperor, which, although long held to be derived from the Roman tital *Cæsar,* is almost certainly of Tartar origin and is a survival of Asiatic dominion in Russia, as may be judged from the fact that there were czars of Georgia and other khanates, evidence of the non-imperial content of the term. In the beginning of the 10th century the Bulgarian prince Symeon assumed this title, which remained attached to the Bulgarian crown. In 1346 it was adopted by Stephan Duschan, king of Servia. Among the Russians the Byzantine emperors were so called, as were also the khans of the Mongols that ruled in Russia. Ivan III., grand prince of Moscow, held the title, and Ivan IV. caused himself to be crowned as czar in 1547. In 1721 the senate and clergy conferred on Peter I., in the name of the nation, the title Emperor of Russia, for which in Russia the Latin word *imperator* is used. But among the Russians the common designation of the emperor is czar, or, as it is more properly spelled, tsar.

Czarina, zär-ē'nä, the title of the wife of the czar of Russia.

Czarovitz, zär'ō-vĭch, or **Czarevitch,** the title of the eldest son of the czar of Russia.

Czartoryski, chär-tō-rĭ'skē, **Adam George,** prince, Polish statesman, and patriot: b. Warsaw 14 Jan. 1770; d. Paris 16 July 1861. His education was completed at the University of Edinburgh and in London. After the partition of his country in 1795 he was sent as a hostage to St. Petersburg. There he formed a close friendship with Prince Alexander, who on his elevation to the throne appointed him minister of foreign affairs and curator of all the educational establishments in Poland. On 11 April 1805 he signed in name of Russia the Treaty of Alliance with Great Britain, after which he resigned his office. On the outbreak of the Polish revolution of 1830 he showed himself active on behalf of his country, and was chosen president of the provisional government (18 December). On 30 Jan. 1831 he became the head of the national government, and gave up the half of his property to the service of his country. On the appointment of Krukowiecki to the dictatorship Czartoryski resigned his post as president of the senate. In the last days of the struggle for freedom he served as a common soldier in the corps of Gen. Romarino. Thenceforth he lived at Paris, ceaselessly engaged in aiding his needy fellow-countrymen. He was excluded from the amnesty of 1831, and his estates in Poland were confiscated.

Czaslau, chäs'low, Bohemia. 1. Town, capital of a circle or district of the same name; located in a fertile plain, 45 miles east-southeast of Prague; and is memorable for the defeat which the Austrians sustained from Frederick the Great in 1742. The Church Saint Peter and Saint Paul has the loftiest steeple in Bohemia, and contains the remains of the celebrated Hussite leader, John Ziska. Pop. (1890), 8,388. 2. The circle or district is well wooded and fertile, yielding excellent crops of corn and flax; and large quantities of minerals, especially iron. Area, 233 square miles. Pop. 61,064.

Czech (or Chekh) Language and Literature. The Czech is a dialect of the Slavonic family of Aryan languages; it is the speech of the people of Bohemia and is spoken also by the Moravians and by the Slovaks of Hungary. It is a language very rich in native radical words which lend themselves readily to combination, and hence the language possesses in itself ample resources for the expression of new ideas without need of recourse to foreign tongues. It has a precise and regular grammatical structure comparable to that of the classical languages; yet like other languages of the Slavonic family it is without a definite form for the passive voice of the verb. The Czech had the rare good fortune in the 15th century of having its alphabetic system constituted according to phonetic laws and as a result each of the letters has a fixed phonetic value, and there are no superfluous letters. To John Hus, who revised the Czech version of the Scriptures is due the credit of setting up a standard both of orthography and of literary expression. Others have since worked on the same lines and now the Czech language is an unexcelled mechanism for the expression of thought.

The language was cultivated for literary production in the 9th century or earlier; but owing to the intrusion of Germanic speech and of Germanic civilization, also to the universal employment of the Latin language by churchmen, the speech of the privileged and the cultured classes was Teutonic or Roman, and the native tongue was for a long time neglected as a means of communication save among peasants and serfs. Hence the literature of Bohemia for centuries was written in Latin and the court speech was German. But there was a remnant of the educated who cherished the mother tongue and kept alive the national traditions; and to them,—and chief among them to the patriotic monks of the abbey of Sazava,—is mainly due the retention of the vernacular speech in its literary forms, and its having been saved from degradation and from becoming the patois of rustics; these monks and patriots saved the literary language from extinction and kept

above the national spirit of the people by reproducing and adding to the epic and lyric poesy and the chronicles of their Slavonic forefathers.

There are in existence fragments of Czech literature dating from the 10th century; the genuineness of other alleged fragments for which a like antiquity is claimed is disputable; we reach firm ground with the Czech version (about 1245) of the Latin work 'Alexandreis,' written by Philippus Gualterus ab Insulis; contemporary with this are several metrical lives of saints and several legends. To the beginning of the 14th century is referred the lengthy 'Chronicle' of Dalimil,—a versified history of the world from the creation to the year 1314; the author cherished a cordial hatred of the Teutonic race. To the 14th century also belongs a series of pungent 'Satires on Craftsmen,' and a notable epic poem, 'The New Council,' by Smil of Pardubitz, who is also the reputed author of a lively and original 'Dialogue Between a Groom and a Scholar.' There is extant also from the 14th century an important law treatise, 'Exposition of the Law of the Land of Bohemia,' by Andreas Duba, the chief justice of the realm. There are extant translations of books of the Scripture into Czech dating from the 13th and 14th centuries,—mostly of books of the New Testament and the book of Psalms. John Wiclif mentions a copy of an *evangelium* (gospel, probably meaning a book of the four gospels) in Bohemian (Czech), German and Latin, owned by Anne of Luxemburg, sister of the Emperor Charles IV., who was hereditary king of Bohemia: Anne was the first wife of Richard II. of England. There were in existence at this time two Czech versions of the Psalter; the Czech version of the whole Bible was made in the beginning of the 15th century. Another monument of Czech literature in the 14th century is a prose chronicle extending from the earliest times to the year 1330, by the priest Pulkava, which he wrote originally in Latin, but which afterward he translated into his native idiom. The most original of the Czech authors of the same period is Thomas of Stitny, a writer on religious and moral questions; his aim was to popularize the teachings of the schoolmen touching matters of belief and Christian living; the titles of his two principal works are: 'General Christian Matters' and 'Books of Christian Instruction.' Finally, to this age is to be referred a Czech version of the 'History of the Trojan War,' written in Italian by Guido di Colonna, but made up from the works of Dictys Cretensis and Dares Phrygius; this was one of the first works in the Bohemian language to be multiplied by the printer's art (1468).

John Hus (died at the stake 6 July 1415) did for the national tongue of the Czechs what Luther did for that of the Germans. He did not himself translate the Bible into Czech, but made a great many changes in the Czech version of the Bible already in existence, and incidentally systematized the orthography of the language. Like the commotions attending the rise of Protestantism, the Hussite wars called forth a swarm of political and religious manifestoes and tractates. Of more lasting importance were the Czech translations of the 'Travels' of Marco Polo and of Sir John Mandeville, which appeared about the same time. Though the printing press was as yet unknown the 'Postils,' the 'Net of Faith,' and other fugitive pieces of the cobbler, Peter Chelcicky, the Hans Sachs of the United Brethren, had a universal circulation among the masses. In 1487 the printing press was set up at Prague, and the following year the Czech Bible was first printed.

The printing press and the Protestant Reformation stimulated literary activity enormously, and there is room here only for a most cursory review of the field. The first grammar of the Czech language was published in 1533. A work, entitled a 'Chronicle,' but which is in fact a collection of old Czech legends, compiled by one Hajek and published before 1550, became the people's *vade mecum;* it is a treasury of Czech myth. Christopher Harant wrote an account of his travels in the Holy Land, a work of real value, which is not yet antiquated; it was reprinted in 1854. After the subjugation of the Czechs in 1621 by Austria, Czech literature with Czech national spirit went into decline and so continued till their resuscitation in the beginning of the 19th century. The first impulse to the Czech renaissance was given by the philological researches of Joseph Dobrovsky. He wrote, not in the national tongue, but in German and in Latin, and his researches were conducted with purely scientific, philological ends; for he had no thought that the Czech language and literature would ever regain eminent standing, but were doomed to extinction in the struggle for life, in which it had been for centuries engaged; his works he regarded as monuments of a language and a literature that before long must be numbered with the languages and literatures of ancient peoples. But his writings and the labors of his successors in the same field, especially Joseph Jungmann, author of a noble dictionary of the Czech language and of a history of Czech literature, called forth a national movement that has seldom had a parallel. Since 1809, date of Dobrovsky's first work on the 'Bohemian Language' (*Ausführliches Lehrgebäude der böhmischen Sprache*) there has been a great revival of national feeling in the Czech people and of Czech literary activity in all departments, poetry, fiction, folklore, history, drama, antiquarianism, philology, music, moral and intellectual philosophy, natural and physical science. In the University of Prague the national language is a recognized medium of instruction; scientific and literary societies employing the national language are numerous; and the scientific and literary periodicals of Bohemia are both numerous and of the highest class.

Czechs (cheks), the extreme western branch of the great Slavonic family of races. The Czechs have their headquarters in Bohemia, where they arrived in the 5th century. The origin of the name is unknown. The total number of the Czechs (including Moravians, Slovaks, etc.), is about 6,000,000, nearly all of whom live in the Austrian empire. The Czechs proper, in Bohemia, number about 2,700,000. They speak a Slavonic dialect of great antiquity and of high scientific cultivation. The Czech language is distinguished as highly inflectional, with great facility for forming derivatives, frequentatives, inceptives, and diminutives of all kinds, and is very musical. Like the Greek it has a dual number, and its manifold declensions, tenses, and participial formations, with their

subtle shades of distinction, give the language a complex grammatical structure. The alphabet consists of 42 letters, expressing a great variety of sounds.

Czegled, tsē'glād, Hungary, large market town, in the county of Pest, circle of Ketskemet, on a plain between the Danube and Theiss, 39 miles southeast of Budapest. The land in the vicinity is well cultivated, and produces large quantities of grain and common red wine. Pop. (1900) 29,900, mostly Protestants.

Czermak, chĕr'mäk, **John Nepomuk,** German physiologist and physician: b. Prague 17 June 1828; d. Leipsic 16 Sept. 1873. In 1865 he became professor of physiology at Jena, and from 1869 till his death filled a similar position at Leipsic. He was the inventor and introducer of the laryngoscope and rhinoscope, and of a new method for the therapeutical and surgical treatment of diseases of the epiglottis and throat. His work on 'The Laryngoscope' has been translated and published in several languages.

Czernigov, chĕr'nē-gōf, Russia, a province; area 20,243 square miles. The surface, with exception of a hilly district along the Dneiper, is flat and the soil fertile. The Dnieper flows along its west frontier, and the Desna passes through its centre. It has numerous lakes, though none are of great extent. All kinds of grain grow in abundance, but the crops often suffer from hosts of locusts. Hemp, flax, tobacco, and the opium poppy grow well, and the forests furnish timber and fuel. The chief mineral products are saltpetre, porcelain-earth, chalk, and a little iron. The interior trade is almost confined to the four annual fairs, which are held in Nijni-Novgorod. The chief exports are cattle, corn, brandy, honey, wax, and potash. Pop., almost all belonging to the Greek Church, nearly 3,000,000.

Czernigov, Russia, town, capital of the province of the same name, situated on the right bank of the Desna, 80 miles north-northeast of Kiev. It is a place of great antiquity, and contains numerous buildings of antiquarian interest. It is the seat of an archbishop, and has many churches — one of them, St. Sophia, supposed to have been founded in 1024 — three monasteries, a gymnasium, and an orphan hospital. Three important annual fairs are held here. Pop. about 27,000.

Czernowitz, chĕr'nō-vĭts, Austria, capital of the province of Bukowina; 720 feet above sea-level, near the right bank of the Pruth, 165 miles southeast of Lemberg. Among its buildings are the palace of a Greek archbishop; the cathedral modeled after St. Isaac's at St. Petersburg; the Armenian Church; the synagogue; and the "Austria Monument." The university was founded in 1875. The manufactures and trade are steadily developing. Pop. (1900) 67,622.

Czerny, chĕr'nē, **George,** Servian hospodar: b. near Belgrade 21 Dec. 1766; d. July 1817. His true name was George Petrovitch, but he was called Czerny or Kara George on account of his dark color, Czerny in Slavonic, and Kara in Turkish, signifying black. In 1788, as the leader of a Servian volunteer corps, he fought in the Austrian army against the Turks, and in 1801 returned to his native country and organized an insurrection with the view of delivering it from the Turkish yoke. He succeeded in driving the Turkish garrisons out of Servia, took the town of Belgrade, and compelled the Porte to recognize him as hospodar of Servia. When the Turks again invaded Servia, in 1813, he was compelled to retire. In 1817 he ventured to return to his native country, in the hope of inducing Milosh Obrenovitch, who had meanwhile received Servia as a vassal state from the Turks, to take part in a comprehensive scheme of rebellion; but Milosh betrayed him to the pasha of Belgrade, who caused him to be assassinated.

Czerny, Karl, Austrian pianist and composer: b. Vienna 21 Feb. 1791; d. there 15 July 1857; son of a teacher of the pianoforte. He was the author of an immense number of pieces, which, from their brilliancy, were at one time extremely popular. His exercises for the pianoforte are still valuable. Among his pupils were Liszt, Döhler, and other distinguished musicians.

Czerny, or **Tcherny,** a Slavonic prefix sometimes signifying *black,* and sometimes *tributary,* appearing in many geographical names, as Czernigov, Czernowitz. It corresponds in the former meaning to Turkish Kara, Czerny George and Karageorge being interchangeable.

Czolgosz, chōl'gōsh, **Leon,** American assassin: b. Detroit, Mich., 1873; d. Auburn 29 Oct. 1901. He was of Polish-German ancestry; worked at various trades in the United States and became affiliated with anarchists through the teachings of Emma Goldman (q.v.). On 6 Sept. 1901, while President McKinley was holding a public reception at the Pan-American Exposition in Buffalo, N. Y., Czolgosz shot him twice. On 14 September the President died; on 23 September Czolgosz was brought to trial; on the 26th was sentenced to death, and was executed in the prison at Auburn, N. Y.

Czuczor, tsoo'tsōr, **Gergely,** Hungarian poet and philologist: b. Audod 17 Dec. 1800; d. Pest 9 Sept. 1866. His two fine hero-ballads, 'The Battle of Augsburg' (1824) and 'The Diet of Arad' (1828), brought him instant celebrity. He was a Benedictine monk, and the eroticism of the first collection of his 'Poetical Works' (1836) brought on him stern animadversion from his superiors. In 1848 he published 'Reveil,' a passionate appeal to Hungarian national sentiment, and was imprisoned for it.

D

D the fourth letter of the English alphabet and the third consonant, is a sonant dental corresponding to the mute dental T. It holds the same place in the alphabets of the Phœnician, Syrian, Chaldee, Hebrew, Samaritan, Greek, and Latin, and in those of all the modern European languages, except the Russian and the two or three others which retain the Cyrillic alphabet; in these the symbol of delta is the fifth letter. The most ancient forms of the symbol D in the languages of Phœnicia, Palestine, etc., are angular with the vertex pointing to the left, for example, ◅, ◁, and the most ancient Greek form was the same angular figure reversed, ▷ (changed afterward to △). In some ancient Greek inscriptions in Hellas itself and in the Greek colonies the angular form of the primitive delta (▷) is rounded to the form D, and this form was adopted by the Latins, who got it from the Greeks who had settled in Campania, now the province of Caserta. The sound of D is produced by pressing the end of the tongue against the upper gums and then forcing the vocalized breath into the mouth. The point of contact of the tip of the tongue with the gums in articulating the sound of D in English pronunciation is a little higher above the insertion of the teeth than when the D of those speaking other languages is sounded, and the same is to be said of the production of the sound of T: the d of continental Europeans is nearer to dh than to the sound of d in English speech. Hence the English sound is alveolar rather than dental. The letter D in very many English words represents an element in the speech of our early language ancestors which became for the Greeks theta (*θ,th*), for the Latins *f*, for the Germans *t*, for example, Eng. *deer*, Gr. *θήρ*, Lat. *fera*, Ger. *tier*. More curious is the change of the Greek name *Odysseus* to the form *Ulysses* in Latin, and within the Latin language itself the change of *olor* to *odor*, and from *dacrima* to *lacrima*. In many words in English *d* is intercalated or appended for phonetic reasons, for example, Old English *thonor* becomes *thunder*, Old English *soun* becomes *sound*, Norman English *jaunisse* becomes *jaundice*; on the other hand the *d* is dropped out of some words, for example, Old English *woodbind* becomes *woodbine*; *godsib*, *gossip*; *godspel*, *gospel*.

D is the Latin numerical symbol for five hundred. The ancient Romans represented a thousand by the symbol Ⅽ|Ɔ, and they took one half of that symbol to express half a thousand, five hundred. (It was later written ⅭIↃ.) The symbol D with a horizontal stroke over it (Ⅾ) stood for five thousand. In Roman personal names D stood for the prænomen Decimus; thus D. Junius Brutus.

As an initial it is used:

1. In chronology, (1) For *Domini*, genit. sing. of Latin. *Dominus* = Lord, as A. D. = *Anno Domini* = in the year of our Lord. (2) For died.

2. In music, as an abbreviation for *Discantus*, *Dessus*, *Destra*, etc.

3. In university degrees, etc., for Doctor, as M.D. = Doctor of Medicine; D.C.L. = Doctor of Civil Law; D.D. = Doctor of Divinity; D.Sc. = Doctor of Science, etc.

4. In English titles, for duke.

D as a symbol is used:

1. In chemistry, didymium.

2. In music.

(1) For the first note of the Phrygian, afterward called the Dorian, mode.

(2) For the second note of the normal scale of C corresponding to the Italian *re*.

(3) For the major scale having two sharps and for the minor scale having one flat in its signature.

(4) For a string tuned to D, for example, the third string of the violin, the second of the viola and violoncello.

(5) For a clef in old mensurable music, D *excellens*.

(6) For *do* in the tonic sol-fa system.

3. In biblical criticism, for the Beza manuscript of the Greek New Testament.

4. In commerce, for English penny or pence, as £ s. d. = pounds, shillings, and pence, being the initial of Latin *denarius*.

Daae, dä'é, **Ludvig**, Norwegian historian: b. Aremark, near Frederikshald, 7 Dec. 1834; d. Christiania May 1893. He was for 20 years an active member of the Storthing; was several times minister in the various Radical cabinets; and won several gold medals with his historical essays on ancient Norway. He paid particular attention to the annals of his own country; his best-known works being: 'Norwegian Village Legends' (1870–2); 'Norway's Saints' (1879); 'The Migrations of the Norsemen to Holland and England' (1880); and others in this field.

Dab, a popular name given to several species of flatfish (*Pleuronectidæ*), which are found on European sea-coasts. The best known of these is the plaice or fluke. This edible fish is covered with small imbricated scales of brown color mottled with orange spots, and averages about two pounds in weight. In London 3,000,000 of them are consumed annually. The American *Pleuronectes* is the common flounder of the northeastern Atlantic coast, of many species, and an excellent table-fish. The habits of all these flatfish are similar. They live on the shallow bottom, and when danger approaches bury their bodies in the mud, leaving only the eyes exposed.

Dabaiba (also written Dabaybe, d'Abaibe, etc.), a region lying south of the Gulf of Darien, of which the boundaries were never exactly defined. Spanish adventurers in the 16th century learned, as a matter of common report, that they might find there, or at least by exploring in that general direction, a temple lined with gold; and in this half-true story told by the Indians of Darien we probably have the earliest form of the Eldorado myth. Balboa, when governor on the Isthmus, organized a Dabaiba expedition which he led in person (1512). One hundred and sixty men in two brigantines proceeded up the Atrato River, but made little headway against the hostile natives. Governor Pedrarias Davila (June 1515) sent 200 men under Luis Carillo and Balboa on the same errand. Attacked by Indians on the Atrato, one half of the soldiers were killed, and the survivors took nothing but news of shameful defeat back to the coast. It seemed that "the mysterious dominion so mysteriously defended must hold great treasure, and in the inflamed minds of the Christians the savage pantheon of Dabaiba had risen into a lofty edifice glittering with gold and gems, and situated in a region rich and beautiful beyond comparison." (H. H. Bancroft.) Subsequently an expedition of 160 men under Tabira and Birues, with light brigantines and canoes, tempted fate upon the river. The savages on this occasion enjoyed more than their usual measure of supernatural protection, for "the divinity of the golden temple" sent a flood which uprooted trees, overturned one of the vessels, and drowned both leaders. Even Francisco Pizarro, who was of the party, shared the superstitious fears inspired by these events to such a degree that he declined to assume command and continue the quest. Peter Martyr speaks of four attempts to gain the golden temple, one expedition attaining a distance up the river of 80 leagues; but "wonderful mischance! — the unarmed and naked people always overcame the armed and armored." Francisco César, captain of infantry, starting from San Sebastian in 1536, with 80-foot soldiers and 20 horse penetrated a short way into the mountains, returning with treasure valued at 30,000 castellanos. Pedro de Heredia in the same year led 210 mail-clad men into the sierra, but came back empty-handed. César, repeating his experiment, secured treasure amounting to 40,000 ducats. Next, Badillo led 350 men from Cartagena to explore the same region in 1537. The expedition lasted more than a year, and was a complete failure. One half of the soldiers died; Badillo was ruined and disgraced; César, who accompanied him, lost his life. Such luring by occasional gains, such varied and dire misfortunes seemed the work of enchantment; but a realistic explanation is not far to seek. We know that the territory southeast of the Gulf of Urabá or Darien was subject to a cacique named Dabaybe; his name is still given to a village in the department of Antioquia and to a spur of the Western Cordillera in Colombia. This mountain range for years was an insuperable barrier preventing the isthmian Spaniards from extending their domain overland toward the south. Accordingly their eager search was fruitless, though the temple actually was in existence. The Indian stories described, accurately enough, the splendors of the Inca empire, of Curi-cancha, and Cuzco (see those titles). But the adventurers could not realize, and the Indians themselves probably did not know, how far away the famous temple at Cuzco really was. The facts in the case, the accent of truth in the Indians' accounts, sustained the explorers' confidence year after year; but confident search in a region far removed from the object sought is always "mysteriously" baffling. Long before the report of Pizarro's discoveries in Peru reached the isthmus, a fixed belief had taken possession of the minds of the Spaniards that a kingdom more desirable than any they had despoiled, with gold-adorned temples, was somewhere hidden away in the heart of the continent. The attributes of elusiveness and mystery had become an indispensable part of the conception; therefore the true accounts of the wonderful Temple of the Sun did not exactly tally with the "glittering phantom" of their imagination. After Quesada (see COLOMBIA), starting from Santa Marta, succeeded in penetrating, by way of the Magdalena River, the region of Colombian uplands which lay beyond Dabaiba, naturally the golden temple was sought still further inland; and thus the headwaters of the Orinoco and Amazon were discovered. Bancroft and other writers following his prompting have suggested that an ancient building in the Cenú valley, near which were found tombs containing gold and gems, may have been the temple of Dabaiba; it is quite impossible, however, to accept this conjecture, for the reason that colonists of San Sebastian came upon the Cenú building at an early date, and, if it had been the real object of their search, they would have been able, with the assistance of the natives, to identify it beyond question. See ELDORADO.

MARRION WILCOX.

Dabajuro, Venezuela, a township in the district of Buchivacoa, state of Falcón. It includes a village of the same name near which a severe battle occurred 7 June 1822, in the war for the independence of Venezuela; the Royalists under Morales defeating the Republican forces. The patriots lost 167 men in the battle, and afterward some of the prisoners, including several officers, were shot, in violation of the treaty of Trujillo.

Dabb, or **Palm-lizard,** an agamoid lizard (*Uromastix acanthurus*), common in the sandy deserts of northern Africa and Arabia.

Dabchick (*Podilymbus podiceps*), a bird of the family *Podicipedidæ* and the smallest of the grebes, distinguished by the thick bill and absence of cephalic crests. The total length slightly exceeds one foot: the back is brownish black; the belly silvery gray mottled with dusk, but whiter and more silky in winter; the bill bluish in summer, dull yellow in winter. It ranges and breeds throughout tropical and temperate America. *P. fluviatilis* is a closely similar European species. See GREBE.

Dabney, Charles William, American consular officer: b. Alexandria, Va., 19 March 1794; d. Fayal, Azores, 12 March 1871. He was made United States consul in the Azores in 1826, and by his services to the people of the islands made his name a household word among them.

Dabney, Charles William, American college president: b. Hampden-Sydney, Va., 19 June 1855. He is a son of R. L. Dabney (q.v.). He was graduated at Hampden-Sydney College

in 1873, and at the University of Virginia in 1877; and for two years studied in Berlin and Göttingen. He was professor of chemistry in the University of North Carolina, and State chemist, and later director of the North Carolina Agricultural Experiment Station at Raleigh, and an executive officer of the Cotton Centennial Exposition, New Orleans, 1884–5, and of other industrial expositions. He was prominent in establishing the North Carolina College of Agricultural and Mechanical Arts, Raleigh; assistant secretary of agriculture of the United States, 1893–7; president of the University of Tennessee, 1887–1904; and president of the University of Cincinnati after 1904. He has published among other works: 'Washington's Interest in Education' (1899); 'History of Agricultural Education in America' (1899); 'Agriculture and Education' (1899).

Dabney, Julia Parker, American artist and author: b. Fayal, Azores, about 1850. She was educated at Teneriffe, Canary Islands, and in Boston; and has published 'Little Daughter of the Sun' (1896); 'Poor Chola' (1897); 'Songs of Destiny' (1898); 'The Musical Basis of Verse' (1901).

Dabney, Richard Heath, American historical writer: b. Memphis, Tenn., 29 March 1860. He is a son of Virginius Dabney (q.v.). He was graduated at the University of Virginia, afterward studying and taking the doctor's degree at Heidelberg, 1885. He was professor of history in Indiana University, 1886–9; and assistant professor, 1889–96; associate professor, 1896–7, and professor of historical and economical science after 1897 in the University of Virginia. He has published: 'The Causes of the French Revolution' (1888); 'John Randolph: A Character Sketch' (1898); and numerous magazine articles and pamphlets.

Dabney, Robert Lewis, American Presbyterian clergyman: b. Louisa Co., Va., 5 March 1820; d. 1898. He was a professor in Union Theological Seminary, Virginia, 1853–83, and from 1883 was professor of philosophy in the University of Texas. During the Civil War he was a major in the Confederate army and in 1862 was Gen. "Stonewall" Jackson's chief of staff. He published: 'Life of General Thomas J. Jackson' (1864); 'Defense of Virginia and the South' (1868); 'Sacred Rhetoric' (1866); 'Sensualistic Philosophy' (1878); 'Theology, Dogmatic and Polemic' (1879); and 'Collected Discussions' (1891).

Dabney, Virginius, American author: b. Elmington, Va., 15 Feb. 1835. His publication of 'The Story of Don Miff, as Told by his Friend, John Bouche Whacker, a Symphony of Life' (1886), reached its 4th edition in six months. He published: 'Gold that Did not Glitter.

Daboia, dȧ-boi'ȧ, the generic name of a venomous serpent of the East Indies, known also as Russell's viper (q.v.).

Daboll, dā'bŏl, **Nathan,** American educator and writer: b. about 1750; d. Groton, Conn., 9 March 1818. He wrote the 'Schoolmaster's Assistant' (1799) and the 'Practical Navigator.' He is best known for his share in the universally used 'New England Almanac,' which he began in 1773.

Daboll, Nathan, American writer: b. Connecticut 1782; d. 1863. He was son of the preceding, and compiled the 'New England Almanac' begun by his father. He is the author of 'Daboll's New Arithmetic,' long a terror to the American school-boy.

Da Capo, dä kä'pō (It. "from the head or beginning"), in music, an expression written at the end of a movement, to acquaint the performer that he is to return to, and end with, the first strain. It is frequently used in the abbreviated form D. C.

Dacca, dăk'ȧ, or **Dhaka,** dhä'kä, India, a commissioner's division in one of the lower provinces of Bengal. It is one of the richest divisions in India, and although containing a good deal of jungle and unoccupied land, produces such quantities of rice as to be called the granary of Bengal. The surface is an uninterrupted flat, and is intersected by two of the largest rivers in the world — the Ganges and Brahmaputra — from whose periodical inundations its extraordinary fertility arises. Dacca was at one time celebrated for its hand-woven muslins, which are of singular delicacy and beauty. This branch of industry, however, is now carried on to a very small extent. The fineness of the yarn or thread used in the making of these muslins is not equal to that in some fabrics of European manufacture, but in durability and delicacy the Dacca muslins excel other muslins. The finest or "royal muslin" used to be worth about $5 a yard. For the most delicate varieties only yarns are used that are some years old. Pop. 9,844,127.

Dacca, India, city, capital of the district of the same name, and for 80 years, during the 17th century, the capital of Bengal. It is situated on the river called the Boor Gunga (Old Ganges), at the distance of about 150 miles northeast of Calcutta. In this city and vicinity, the celebrated Dacca muslins are still manufactured to a small extent, and jute works have been established in recent years. It has an extensive manufacture of shell bracelets, much worn by the Hindu women. The city was formerly much more extensive than it is at present, and exhibited a degree of splendor to which it has now no pretensions, as the magnificent ruins of bridges, causeways, caravanseries, palaces, gardens, etc., sufficiently prove. Dacca is considered one of the healthiest and most pleasant places in Bengal. In this city is one of the four hospitals for the insane under the Bengal presidency, and a college maintained at the public expense, in which there are about 340 students, mostly Hindus. Pop. (1901) 90,679.

Dace, a name rather loosely applied to various species of small fresh-water fishes of the minnow family (*Cyprinidæ*), but especially to members of the genus *Leuciscus*, of which 22 North American species are discriminated; others belong to *Rhinichthys*, *Notropis*, and *Semotilus*, those of the latter being also called chubs and roach. *Semotilus atromaculatus*, the horned dace, is one of the best known and largest species, and abounds in the small brooks of the eastern half of the United States. As in many of the other species, the upper surface of the head of the male is ornamented during the breeding season with cutaneous tubercles. Because of their abundance the dace are im-

portant as furnishing food for larger fishes, and some of the larger species are much sought by juvenile anglers. The European dace (*Leuciscus vulgaris*) is common in British rivers, as well as in those of France, Germany, and Italy. It prefers deep, clear streams and swims in shoals. See CYPRINIDÆ.

Dacelo. See JACKASS KINGFISHER.

Dach, däh, **Simon,** German lyrist: b. Memel 1605; d. 1659. His numerous hymns and songs are found in various collections, his hymns especially in the 'Scriptural Arias' of Heinrich Albert. His 'Annie of Tharau,' a Low-German lay for the wedding of his friend Parson Portatius with Anna Neander, became a popular favorite; his 'Praise of Friendship' seems to belong to a better age; and his spiritual songs, 'In Thy Control, O Lord,' 'Be Comforted, my Soul,' etc., are hardly surpassed by any compositions of his day.

D'Ache', Caran, kä-räṅ däsh. See POIRE, EMMANUEL.

Dachshund, däks'hoont (Ger. *dachs,* badger; *hund,* dog), a breed of small German hounds with very long, cylinder-shaped bodies; short, crooked legs; large heads; long pendant ears; and short, stiff, smooth hair. In color these dogs are black-and-tan, or tan with black ears, the former being the characteristic coloring of the best sort. They were originally used in Germany to hunt badgers, and sometimes even in fox-hunting. Though slow in movement, they are possessed of a keen scent, and great power of endurance, rendering them valuable as hunting-dogs when suitably trained. They are much used by sportsmen on the continent of Europe, but their usefulness is impaired by the difficulty of keeping them under proper command. The dachshund is akin to the old English turnspit, and a similar dog is depicted on the ancient Egyptian monuments.

Dacia, dā'shĭ-a, in ancient times, a district of uncertain limits to the north of the Danube, inhabited by the Daci or Getæ, afterward a Roman province. It comprised that region now known as Moldavia, Wallachia, and portions of Transylvania and Hungary. For a long time the Daci were formidable enemies of the Romans, and during the reign of the Emperor Domitian obtained so great an advantage that the emperor was compelled to accede to a disgraceful peace. To wipe off this stain Trajan, the second emperor after Domitian, in the year 100 A.D. invaded the Dacian territory, and forced the Dacian king, Decebalus, to accept humiliating terms of peace. These he soon broke; and Trajan entering Dacia a second time, again subdued it, and then erected it into a Roman province, 106 A.D. The Romans remained masters of this province till the reign of the Emperor Aurelian, when, in 274 A.D., they withdrew from the region to the north of the Danube, and assigned to the Roman colonists of Dacia a territory on the south of the Danube lying between Upper and Lower Mœsia, which was hence called Dacia Aureliani. The former Dacia was now successively overrun by the Goths, Huns, Gepidæ, and Avares. Since that time the history of this country, which then lost the name of Dacia, is to be sought for in that of the provinces of which it formerly consisted.

Dacier, André, än'drā dā-sē-ā, French philologist: b. Castres, Upper Languedoc, 6 April 1651; d. 18 Sept. 1722. He studied at Saumur under Tanneguy Lefèvre, whose daughter Anne was associated in his studies. After the death of Lefèvre, in 1672, he went to Paris, and in 1683 he married the daughter of his former teacher. In 1695 Dacier was elected a member of the Academy of Inscriptions and of the French Academy; of the latter he was afterward perpetual secretary. The care of the cabinet in the Louvre was intrusted to him. Besides editions of 'Pompeius Festus' and the 'Œuvres d'Horace, en Latin et en Français, with the Nouveaux Eclaircissemens sur les Œuvres d'Horace' (1681–9), and 'The Nouvelle Traduction d'Horace' with critical annotations, he prepared translations of 'Marcus Antoninus,' 'Epictetus,' 'Aristotle's Art of Poetry, with Annotations,' etc.

Dacier, Anne Lefèvre, äṅ lė-fāvr, French classical scholar: b. Saumur March 1654; d. Paris 17 Aug. 1720. She was wife of the preceding, and early displayed her learning by an edition of 'Callimachus.' Her learned works were not interrupted by her marriage, which took place in 1683. In her 'Considérations sur les Causes de la Corruption du Goût' she defended Homer with the acuteness of a profound commentator, and Lamotte replied with a great deal of wit and elegance; on which account it was said Lamotte wrote like an ingenious woman, Madame Dacier like a learned man. In her 'Homère Défendu' she showed little mercy to Hardouin, who had written a satirical eulogy of this poet. On this occasion she was said to have uttered more invectives against the reviler of Homer than the poet himself had placed in the mouths of all his heroes. She translated 'Terence' and three pieces of 'Plautus,' in the prologue of which she treats of the origin, the cultivation, and changes of dramatic poetry with acuteness. Her translation of the 'Plutus' and the 'Clouds' of Aristophanes deserves indulgence as the first translation of the Greek comic poet. Her translation of Anacreon and Sappho, with a defense of the latter, met with success. Equally estimable for her character and her talents, she gained as many admirers by her virtue, constancy, and equanimity, as by her works. She was a member of several learned academies.

Dacite, an igneous rock of the diorite family, of porphyritic or compact texture, having crystals of plagioclase felspar quartz and biotite in a glassy or finely crystalline-ground mass. The name is derived from the old province of Dacia, now part of Hungary. Dacites grade into andesites by a lessening of the amount of silica, and differ from rhyolites and trachytes in containing plagioclase rather than orthoclase felspar. A typical dacite shows on analysis the constituent acids and bases in about these proportions: SiO_2 67.2; Al_2O_3, 17.0; Fe_2O_3, 3.5; FeO 1.2; CaO 4.5; MgO 1.5; Na_2O 3.7; K_2O, 1.6. Dacites are found at Lassen's Peak, Cal.; in the Yellowstone Park; in the Eureka District, Nev., and elsewhere in the western United States. See DIABASE.

Dacoits', bands of robbers in the East, especially in Burma, India, where for years they were the terror of the country until the annexation of Burma by the British in 1886.

Da Costa, da kŏs'ta, **Izaak,** Dutch poet and theologian; b. Amsterdam 14 Jan. 1798, d. Leyden 28 April 1860. Among his works are: 'Prometheus' (1820); 'Poems' (1821-2); 'Gala Songs' (1828); and 'Hagar' (1840).

Da Costa, Jacob Mendes, American physician; b. St. Thomas, W. I., 7 Feb. 1833; d. Villanova, Pa., 11 Sept. 1900. He was graduated at Jefferson Medical College in 1852, practising in Philadelphia. In 1863 he became lecturer in Jefferson Medical College, in 1872 professor of the theory and practice of medicine there, and in 1891 professor emeritus. In 1895 he was chosen president of the College of Physicians and Surgeons in Philadelphia. He wrote: 'Harvey and His Discovery'; 'Medical Diagnosis,' etc.

Dacrocystitis, dăk-rō-cys-tī'tĭs, an inflammation in the tear-sac. It may result only in the sub-acute swelling of the tear-sac, or it may become purulent, very much inflamed, swollen and painful, and finally discharge pus. Prompt evacuation by surgical means is the safest and best treatment.

Dacryd'ium, a genus of tall trees, mostly Australian, of the natural order *Taxaceæ*, to which also belong the genera *Podocarpus* and *Taxodium*, important timber and ornamental trees. Several species are of wide utility in ship- and house-building and furniture-making, especially for carved furniture; others yield edible fruits (drupes). A kind of beer is made from the young twigs of some species. The most valued species are probably *D. kirkii*, *D. cupressinum*, and *D. franklinii*, the so-called huon-pine, which is really a yew. They often attain heights of 100 feet and diameters of four feet or more.

Dacryo'ma, a disease of the lachrymal duct of the eye, by which the tears are prevented from passing into the nose, and consequently run over the eyelid.

Dac'tyl, in Greek and Roman versification, a foot consisting of one long followed by two short syllables. In the following line, for example,

Tityre | tu patu | lae recu | bans sub | tegmine | fagi,

the first, second, third, and fifth feet are dactyls. In modern hexameter verse a dactyl is represented by one accented and two unaccented syllables. The word is derived from the Greek *daktylos*, a finger, because a finger has one long and two short joints. See RHYTHM.

Dactyl'iomancy (Greek *daktylios*, a ring, and *manteia*, divination), the pretended art of divining by means of finger rings.

Dac'tylis, or **Orchard-grass,** a monotypic genus of the grass family (*Gramineæ*) native of Europe and Asia. It is naturalized in America, and cultivated as a fodder plant. The flowers are in rounded compressed spikelets at the end of a one-sided panicle. The fruit is loosely enveloped in the glume. The common orchard grass (*D. glomerata*) is often met with in fields and waste places. It is a coarse grass, little relished by cattle in its wild state, but is acceptable in its cultivated state. It grows from New Brunswick south to South Carolina, westward to Kansas, and north to Manitoba. It is sometimes called cocksfoot-grass. See GRASSES.

Dactyli'tis, etymologically, an inflammation of the finger, but generally restricted to an osteomyelitis of the phalanges or metatarsal or metacarpal bones. This may be either tuberculous or syphilitic. In tuberculous form the bone slowly enlarges, the skin becomes reddish, softening takes place, and pus is discharged through a short cavity which leads to dead bone. In its treatment care should be paid to the general condition of the patient. General up-building, by cod-liver oil and other tonics, is necessary. Surgical procedures may be imperative. In the syphilitic form, which usually affects infants, there is as a rule a gummatous deposit in the bones. It resembles the tuberculous forms, but responds to treatment by means of potassium iodide.

Dadayag, dä-dä-yäg', the name of a tribe of the Malayan race, who live in the Cagayan mountains in Luzon. The Dadayags are said to have been cannibals. Their speech differs in some respects from that of any other of the 47 tribes of the Malayans.

Daddy-long-legs, a name sometimes substituted for the more appropriate term "crane-fly," to designate the small British dipterous insect of the family of *Tipulidæ*, some groups of which are harmless, and dance in the twilight air, while others are injurious to growing crops. They are true flies, though having long legs. In America the name daddy-long-legs is applied only to the harvest-spider, of the family *Phalangidæ*, which is not a fly. The body is very small when compared with the great length of the legs, which contain over 50 joints each. The legs are thought to be organs of sense as well as of locomotion. This harvestman lives on small insects and is entirely harmless to man.

Dado, dā'dō, an architectural term for the middle part of a pedestal, that is to say, the solid rectangular part between the plinth and the cornice; also called the die. In the interior of houses it is applied to a skirting of wood several feet high round the lower part of the walls, or an imitation of this in wall-paper, painting, etc.

Dadu'chus (Lat.-Gr., *dadouchos*), literally a torch-bearer, but applied as an epithet to any of the ancient divinities or other personages when they were represented as bearing a torch or flambeau. Daduchi were also those persons who, in the celebration of the Eleusinia at Athens, carried the sacred torches. The daduchus was inferior to the hierophant, and of equal rank with the keryx.

Dædalion, dē-dāl'ĭ-ŏn, the son of Lucifer, changed, according to the Greek legend, by Apollo into a falcon.

Dædalus, dē'da-lŭs or dĕd'ā-lŭs, mythical Greek sculptor, the scene of most of whose labors is placed in Crete. According to the common accounts Dædalus lived three generations before the Trojan war, was distinguished for his talents in architecture, sculpture, and engraving, and as the inventor of many instruments; for instance, the axe, the saw, the plummet, the auger; also of glue, and masts and yards for ships. As a sculptor he wrought mostly in wood, and was the first who made the eyes of his statues open. He built the famous labyrinth and a temple of Artemus Britomartis in Crete; and executed for Pasiphaë the noto-

rious wooden cow. Being imprisoned with his son Icarus, he invented wings for flying. The wings were fastened on with wax, and Icarus flew so high that the heat of the sun melted the wax, and the wings dropped off, leaving him to fall into the sea, whence the Icarian Sea is said to have received its name. Dædalus himself reached Sicily, on the southern coast of which a place was called, after him, Dædalium. Philologists suppose that Dædalus is not really a proper name, but the common appellation of all the first architects, metallurgists, and sculptors in Grecian antiquity, being derived from or akin to the Greek daidallein, "to work with skill." The mythical Dædalus is sometimes confused with Dædalus of Sicyon.

Dædalus of Sicyon, Greek sculptor who lived about 400 B.C. He is said to have been the pupil, and some authorities say the son of Patrocles. The trophy or stack of armor erected at Olympia, in remembrance of the victory over the Lacedæmonians, was attributed to Dædalus. Other works credited to him are: 'Two Boys using the Strigil'; 'Cowering' or 'Crouching Venus'; and a number of portrait statues of victors in the Olympian games.

Dæmonelix, a scientific name provisionally given to an extraordinary formation, apparently fossiliferous, extending over a large area in northeastern Nebraska and eastern Wyoming. The soft sandstone of this region has undergone excessive erosion, leaving fantastic figures, some of them 40 feet high. The objects to which the term is especially applied are of various shapes, including gigantic pillars, lower cake-like forms, and columns appearing like fingers and cigars. Those particularly exciting scientific inquiry are spiral and twisted, giving rise to the local name "Devil's Corkscrew." These in some cases resemble huge hop poles with definite vines running up spirally, or screws with exactly cut threads. In other cases the corkscrew is closely imitated, leaving the spiral without the central pole. So far as the tests have gone, the composing material is found to contain cellular, non-vascular, parenchymatous tissue — a fibre distinguishing it from its stony matrix, and not to be referred to animal but rather to plant origin, and pointing to the cryptogam group.

Daendels, Hermann Wilhelm, hĕr'mân vĭl'hĕlm dän'dĕls, Dutch general: b. Hattem Gelderland, 1762; d. Africa June 1818. He took part in revolutionary disturbances in Holland in 1787, and was in consequence compelled to seek refuge in France. In the campaign of 1793 he rendered important service to Dumouriez, and was elevated to the rank of a general of brigade. In 1806 he took service under the king of Holland, and from 1808 to 1811 he was governor-general of the Dutch East Indian possessions, and published 'Staat der Nederlandsche Oost-Indische Bezittingen' (1808–11). On the overthrow of Napoleon, the new king of Holland, William I., intrusted Daendels with the organization of the Dutch colonies on the coast of Africa, and there he died.

Dáet, dä'ät, Philippines. 1. City of Luzon, in the province of Ambos Camarines, situated between the Dáet River and one of its branches. It is a radiating point of several roads, a port of entry. It was the capital of the Spanish province of Camarines Norte. Pop. 10,650. 2. A river which enters the sea near the town of the same name.

Daffodil (corrupted from the Latin *asphodelus*), the English name of those species of *Narcissus* which have a large bell-shaped corona. The common daffodil (*N. pseudo-narcissus*) is a native of England and of nearly all parts of Europe, growing in woods and hedges, and often cultivated in gardens, where it not unfrequently becomes double. In gardens many varieties of it are among the most esteemed of early flowers.

Dagami, dä-gä'mē, Philippines, town in the province of Leyte, on the Binahaan River, 16 miles south-southwest of Tacloban. Pop. 25,000.

Däge, Eduard, ĕd'ooärd dä'gĕ, German historical painter: b. Berlin 10 April 1805; d. there 6 June 1883. He was a pupil of Neiderlich and Wach, finishing his studies in Italy. Besides his religious paintings Däge was remarkable for his genre pictures of small size. His chief works are found in the churches of Rostock and Sigmaringen, and in the chapel of the Château at Berlin. His 'The Old Sacristan' and the 'Discovery of Painting' hang in the National Gallery at Berlin. Among his other works are many altar pieces for churches: 'The Parcæ' and 'Woman and Child,' in the Raczynski Gallery in Berlin; 'Initiation of a Nun'; 'Shelter at the Altar'; 'Charitable Monk'; 'Roman Woman and Child.'

Dagger, a weapon resembling a short sword, with a two-edged, sometimes three-cornered, sharp-pointed blade. In the feudal period it was carried by knights in addition to their sword; and in single combat it was wielded in the left hand, and used by them to parry the blows of their adversaries, and also to despatch a vanquished opponent, unless he begged for quarter, whence it was called the "dagger of mercy." A kind of dagger known as a dirk was formerly used by the Scottish Highlanders, and is still regarded as an essential part of a Highland costume. The dagger has been regarded as especially the weapon of assassins. In printing, a dagger (†) is often used for the second reference on a page when there is more than one.

Dagger-moth, a common name given to both *Acronycta* and *Apatala*, genera of nocturnal moths, which feed upon the leaves of orchard trees and small fruits. *Acronycta* has fore wings varied with dagger-like black marks. *Apatala* has gray fore wings margined with black dots and transverse lines. The caterpillar is of a velvety black color, and is beautiful. It changes into the pupa by wrapping itself in leaves bound with a silken thread.

Daggett, Mary Stewart, American writer: b. Morristown, Ohio, 30 May 1856; married Charles Daggett in 1875. She has published: 'Mariposilla' (1895); 'The Broad Isle' (1899).

Dagh, a Persian word signifying mountain; hence Daghestan, land of mountains.

Daghestan, dä-gĕs-tän', Russia, province in the Caucasus, stretching along the west side of the Caspian Sea; area, 11,036 square miles. Its fertile and cultivated valleys produce good crops of grain, silk, cotton, flax, and tobacco.

The inhabitants are chiefly Mohammedans, of Tartar and Circassian origin. Capital is Derbend. Pop. 001,087.

Dagnan-Bouveret, Pascal Adolphe Jean, pas-kal a-dolf zhon dan-yan boov-ra, French painter: b. Paris 7 Jan. 1852. He was a pupil of Gerome, and recipient in 1874 of the second "Grand Prize of Rome." He soon broke with the style of Gerome and showed the influence of Bastien Lepage. His picture of the death of Manon Lescaut, which took the medal of the third class at the Salon of 1878, showed him to be in possession of an original and particularly individual style of painting. 'A Wedding Party at the Photographer's,' exhibited in the Salon of 1879, was much admired for composition and technique. But this style was too close to caricature and was soon abandoned. In the Salon of 1880 he displayed a much more serious form of talent. His picture 'An Accident,' which took the medal of the first class that year, remains one of his masterpieces, being greatly admired for the truth of its types and expressions. These early works ranked him among the most keen portrayers of our modern manners. 'The Blessing of a Young Couple before Marriage' (1882) bore the stamp of extraordinary poetical feeling which his later paintings, illustrating, for the most part, the life, customs, and costumes of Bretagne, served to accentuate. In his 'Hamlet and the Grave Diggers' the artist is himself represented as the moody Danish prince. Among his best-known works are: 'The Consecrated Bread,' in the Luxembourg; 'The Virgin'; 'The Bretons at the Pardon' (1887); 'The Breton Peasant' (1888); 'The Cemetery of Side Kebir'; 'The Conscripts'; 'The Lord's Supper' (1896), a very great work; 'The Horses at the Watering Trough' and two portraits of de la Rochetaille and Gustave Courtois. Very modern in his taste for individuality, he resembles the great masters in the touching simplicity of his feeling, and the idealism which is evolved from his strong realism and illumines it. See Stranahan, 'History of French Painting' (1890); Van Dyke, 'Modern French Painters' (1896).

Dago, dāg'ē, or **Dagden,** Russia, an island included in the government of Esthonia. It is situated to the southwest of the entrance of the Gulf of Finland, and has productive fisheries. The soil is mostly poor, and the coast rocky. The inhabitants include many Swedes. Pop. about 10,000.

Dag'oba, in Buddhist countries and those which at one time held the Buddhist faith, a massive erection containing relics. The word is said to be derived from *dā, dātu,* or *dhātu,* a relic, and *geba* or *garbha,* the womb. They are built of brick or stone, are circular in form, and are erected on natural or artificial mounds, while the stone or brick structure itself sometimes rises to an immense height. The contents of a dagoba usually consist of stone or metallic vessels of various shapes and sizes. One of the articles is usually a silver casket, with a gold casket, often highly wrought with chased work on the surface and set with precious stones, and this second casket is either enclosed in the first or lying beside it with the rest of the objects. Some of the smaller articles, such as pearls, gold, buttons, rings, beads, etc., are sometimes contained in these caskets, which are in some cases scratched on the surface with a peculiar character. These dagobas have always been held in the highest veneration by the Buddhists, and a common mode of testifying their veneration is to walk around them, repeating prayers the while. Some remarkable dagobas are to be seen at Anuradhpura, in Ceylon.

Dagobert (dăg'ō-bert or dā-gō-bār) **I.,** king of the Franks: b. about 600; d. Epinay 638. In 628 he succeeded his father, Clothaire II., who had acquired the divided members of the Frankish empire. He waged war with success against the Slavonians, Gascons, and Bretons; but stained the splendor of his victories by cruelty, violence, and licentiousness. After he had conquered the Saxons, it is said that he caused all those whose stature exceeded the length of his sword to be put to death. He deserves praise for his improvement of the laws of the Franks. He was buried in St. Denis, which he had founded.

Dagon, a deity of the Philistines, whose image is generally believed to have been in the form of a triton or merman, with the upper part human and the extremities, from the waist downward, in the shape of the tail of a fish. From this latter circumstance the name is derived, from the Hebrew *dag,* a fish. Dagon and his temple are mentioned in Scripture, more especially in 1 Sam. v. 4. Milton alludes to him in describing the infernal senate in 'Paradise Lost.'

Daguerre, Louis Jacques Mandé, loo-ē zhăk man-dā dā-gār, French inventor: b. Cormeilles, Seine-et-Oise, 18 Nov. 1789; d. Petit-Brie, near Paris, 10 July 1851. He was at first a scene-painter at Paris, and while engaged in painting panoramic views, he discovered a method of representing moonlight, day and night, changes of season, and so on, by the proper illumination of a large transparent canvas painted on both sides. (See DIORAMA.) The pictures were first exhibited in Paris in 1822. On 19 Aug. 1839 his successful completion of photographic printing was announced to the Academy by Arago. As early as 1814 Nicéphore Niépce had directed his attention to photography, and in 1827 had delivered pictures on metal to the Royal Society. In 1826 he had been joined by Daguerre, and on 14 Dec. 1829 a formal agreement was made between them. Niépce died 5 July 1833, and had apparently before his death given up the hope of succeeding with a plate sensitized by iodine. Daguerre, however, persevered, and at length produced the method which has been since called daguerreotype. See DAGUERREOTYPE PROCESS.

Daguerreotype (dā-ger'-ō-tīp) **Process,** one of the earliest methods known for fixing the image afforded by the camera, and thus producing permanent pictures, or "photographs." As practised by Daguerre, the method consists in exposing a silver plate to the action of iodine vapor until a sufficient coating of iodide of silver is produced upon it, and then allowing the image in the camera to fall upon it for a time varying from three minutes to an hour or more, according to the nature of the subject and the intensity of the light. The plate is then submitted to the action of the vapor of mercury, which condenses most upon the parts where the light has acted most, and in this way greatly increases the distinctness

of the image. The plate, after development by mercury vapor in this way, is immersed in a solution of hyposulphite of soda, which dissolves those parts of the iodide that have not been affected by light, and thus renders the picture permanent. Daguerre made the details of his process public in 1839, and for this he was awarded a pension by the French government. Important improvements in the method were soon made. The iodide of silver is so feebly sensitive to light that Daguerre, in his public demonstration of 17 Sept. 1839 gave his picture an exposure of 1 hour and 12 minutes. In December 1839, before the first French photograph by the iodine process had been received in the United States, Dr. Paul Beck Goddard of Philadelphia discovered that iodine could be advantageously replaced by bromine, an element discovered by Balard 13 years before. By the use of bromine, the sensitiveness of the plate was increased so greatly that Dr. Goddard obtained some practically instantaneous views. The earlier method had been tried for portraiture, but, owing to the great exposures required, the results were described by a newspaper of the time (and no doubt with reason) as «most terrific facsimiles of the human visage.» Upon the substitution of bromine for iodine, or the use of bromine in conjunction with iodine, the exposures were reduced to more reasonable lengths, and the pictures that were obtained were much less «terrific.» Early in 1840 Robert Cornelius, of Philadelphia, fitted up a room exclusively for portraiture, and this was the first photographic studio in the world. The expensive silver plates were afterward replaced by plates of copper that had been heavily electroplated with silver, and a method of toning the pictures by the use of chloride of gold was also devised. Daguerre was associated, in his experimental work, with Nicéphore Niépce, who had previously discovered the bitumen process (q.v.) of taking photographs; and many authorities maintain that Daguerre took unfair advantage of his partner, and published, as his own, processes for which Niépce should have had equal credit. However this may be, it is certain that Niépce died in 1833, some years before Daguerre produced any pictures by the method that now bears his name; and it would appear that Daguerre is at least entitled to the sole credit for the discovery of mercury as a developing agent. The way in which this discovery came about is of deep interest, and as the legend was cited by Professor Liebig as one of the finest examples of the inductive method of reasoning, it may perhaps be received with some degree of confidence in its authenticity. Daguerre had discovered that iodide of silver is affected by light, and he had repeatedly iodized silver plates and exposed them in his camera, with the result that feeble images were obtained. He was filled with hope that some way might be found to intensify these images, but he worked for years without success, and Niépce died with a feeling of regret that they had wasted so much time upon a method that was apparently incapable of yielding the results that they sought. On one occasion, after the death of Niépce, Daguerre removed one of his old plates from a closet in which it had been stored, and was about to repolish it and use it over again in a new experiment, when he observed that the view to which it had been previously exposed, and which showed but faintly when he had put the plate away, was now strong and clear. Without disturbing anything in the closet, he prepared a new plate, sensitized and exposed it as before, and placed it in the closet for a similar time. The same intensification of the image was observed. He concluded that the developing agent that he had sought so indefatigably was present in his closet, but he had no idea what it could be. To identify it, he prepared and exposed plate after plate, each time leaving the plate where the first one had stood, but each time removing one article from the closet. The pictures still developed, even when the last thing had been apparently removed. He found, however, that some mercury had been spilled in the closet, and being driven to the conclusion that this was the mysterious agent sought, he tried it, and his mercury-development process was the result.

Dagun, a god worshipped in Pegu. According to Indian mythology, when Kiakiak destroyed the world, Dagun reconstructed it.

Dagupan, dä-goo-pän', Philippines, a town in the province of Pangasinan, Luzon, situated on the Lingayen River where it enters the gulf of the same name, about 130 miles northwest of Manila, on the Manila & Dagupan Railroad. It is an important road centre, and has a large trade. It was one of the strongholds of the Filipino insurgents and the point where most of the filibustering expeditions landed. Soon after hostilities between the United States and the insurgents opened, the American military authorities were unanimous in the opinion that Dagupan should be made a base of operations, but sufficient troops were lacking till November 1899, when an expedition left Manila for this place under command of Gen. Wheaton. A landing from the transports, supported by a number of naval vessels, was made at Lingayen, a suburb of Dagupan, which has a sheltered harbor and had hastily constructed earthworks. The works and town were shelled, but there was no response from shore. As the American troops were being landed in steam launches a long line of insurgents suddenly appeared among the sand dunes and fired upon the troops. The Americans returned the fire, completed their landing, and drove the insurgents out of Dagupan, and then started on a march to the east and south in the expectation of surrounding Aguinaldo at Tarlac, where he had established his headquarters.

Dahabieh, dä-hä-bē'ė, a barge-like boat used on the Nile for conveyance of travelers. It varies considerably in size, has one or two masts, with a very long slanting yard on each mast supporting a triangular or lateen sail, and accommodates from two to eight passengers. Wealthy travelers often hire one of these vessels for a trip up and down the river, the voyage to the First Cataract and back, under the most favorable circumstances, occupying seven weeks and three weeks more if prolonged to the Second Cataract.

Dahl, Johann Kristen Clausen, yō'hän krĭs'tĕn klow'sĕn däl, Norwegian landscape painter; b. Bergen, Norway, 24 Feb. 1778; d. Dresden, 14 Oct. 1857. His talent displayed itself early and he studied at the Academy of Copenhagen 1811–18. He then went to Dresden, where from 1821 onward, he was professor of

painting in the Art Academy. Among his works are 'Storm at Sea' (1823); 'Winter Landscape.' He was a prolific painter and his works are found in many European galleries. See Aubert, 'Maleren Professor Dahl' (1892–4).

Dahl, Konrad Neuman Hjelm, kŏn'rad nel'man hyelm, Norwegian poet and novelist: b. Drontheim 24 June 1843. He is author of a series of stories and novels of Norwegian and Lapp life, with much insight into nature and into the heart of the people. Most notable among them are: 'The Finnish Youth' (1873); 'The Lion' (1874); 'Eda Mansika' (1875); 'The Voyager in the Icy Sea' (1878).

Dahl, Michael, Swedish painter: b. Stockholm, Sweden, 1058; d. London, England, 20 Oct. 1743. He was taught painting by Ernstraen Blocker; later studied in France and Italy; and settled in London in 1688, where he had a very successful career. During the reign of Queen Anne and George I. he acquired an extensive patronage among the nobility and at court. His coloring is good and the accessories are rendered honestly, though in rather a tasteless style. He did not display either originality or genius, but was content to portray his patrons as he found them.

Dahlak, dä-lak', a group of three islands, with many smaller rocks, in the Red Sea, off the Bay of Massowah. They were famous in Roman times for their pearl-fisheries, but the beds have long since been exhausted and abandoned. The inhabitants number about 1,500, and are under the rule of a sheik holding authority from Egypt. They carry on a trade with the Arabian coast.

Dahlgren, dal'grĕn, **Fredrik August,** Swedish poet and dramatist: b. Nordmark 20 Aug. 1816; d. 1895. He wrote many dialect songs and ballads, collections of which were published in three volumes (1876). These have attained an extraordinary degree of popularity. Of his dramas many have been very successful; his 'Vermlandingarne,' a musical drama (1846), had more than 100 consecutive representations. He translated a great many dramas from foreign languages, and wrote a history of the Swedish stage.

Dahlgren, dāl'grĕn, **John Adolf,** American naval commander: b. Philadelphia, Pa., 13 Nov. 1809; d. Washington, D. C., 1870. In 1826 he entered the navy of the United States as a midshipman, in 1837 was advanced to the rank of lieutenant, and in 1855 to that of commander. From the year 1847 he was employed on ordnance duty, and invented the cannons which are called after him Dahlgren guns, besides contriving a more effective method of arming gunboats with 12 to 24 pounder howitzers, throwing canister-shot and shrapnel-shells. At the outbreak of the Civil War he was commander of the naval station at Washington; in July 1862 he undertook the supreme command of the South Atlantic squadron; and after the death of Admiral Foote in 1863 was appointed to the command of the fleet stationed before Charleston. He is the author of 'Thirty-Two Pound Practice for Ranges' (1850); 'Systems of Boat Armament in the United States Navy' (1852); 'Naval Percussion Locks and Primers' (1852); 'Ordnance Memoranda' (1853); and 'Shells and Shell-guns' (1856). Consult 'Memoir of John A. Dahlgren' (1882).

Dahlgren, dāl'grĕn, **Karl Fredrik,** Swedish poet and humorist: b. Stens-Bruk, East Gothland, 20 June 1791; d. Stockholm 2 May 1844. He excelled in descriptions of nature and in the idyllic burlesque. Many of his songs and ballads have a permanent place in the treasury of Swedish popular songs. For years he published a 'Muses' Almanac,' containing his stories and comic sketches. His novel 'Nahum Fredrik Bergstrom's Chronicle' (1831) is a work of distinguished merit.

Dahlgren, dāl'grĕn, **Madeleine Vinton,** American author: wife of Rear-Admiral Dahlgren; b. Gallipolis, Ohio, about 1835; d. Washington, D. C., 28 May 1898. She was married in 1865 to J. A. Dahlgren (q.v.). Her works include: 'Idealities' (1859); 'South Sea Sketches' (1881); 'Etiquette of Social Life in Washington' (1881); 'Memoirs of John A. Dahlgren' (1882); 'The Lost Name'; and 'Lights and Shadows of a Life' (1886). For her Spanish translation of Donoso Cortes' 'Catholicism, Liberalism, and Socialism,' she received the thanks of Pius IX.

Dahlgren, Ulric, American military and naval officer: b. Bucks County, Pa., 1842; d. 4 March 1864. He was a son of Rear-Admiral J. A. Dahlgren (q.v.). At the outbreak of the Civil War he became aide, first to his father and later to Gen. Sigel, and was Sigel's chief of artillery at the second battle of Bull Run. He distinguished himself in an attack on Fredericksburg and at the battle of Chancellorsville, and on the retreat of the Confederates from Gettysburg he led the charge into Hagerstown. He lost his life in a raid undertaken for the purpose of releasing national prisoners at Libby prison and Belle Isle.

Dahlgren Gun (named from Rear-Admiral John A. Dahlgren), a gun in which the front portion is materially lightened and the metal transferred to the rear, giving the "bottle-shape," which caused some surprise on its first appearance in Europe. Col. Bomford, chief of ordnance of the United States army, began making this experiment previous to the War of 1812, and gave the name of "Columbiad" to the piece.

Dahlia, dā'lĭ-ạ, a genus of perennial herbs of the natural order *Compositæ*, closely related to the genera *Bidens*, *Coreopsis*, and *Cosmos* (q.v.), which are distinguished by technical characters. Indeed, *Cosmos diversifolius*, or black cosmos, is well known to American gardeners as *Bidens* and *Dahlia*. The true dahlias are much confused as to nomenclature, only about 10 well-authenticated species being recognized out of a large number of synonyms. With few exceptions (Central American species) they are natives of Mexico. Six species are cultivated, but only one of these (*D. variabilis*) and its apparent sub-species, *D. juarezii*, are of wide horticultural importance. The former has given rise to several thousand horticultural varieties since 1814, when well-marked double varieties first appeared; the latter, which was introduced about 1879, has produced a considerable number popularly known as cactus dahlias. There are also many single varieties. Considering the short time the dahlias have been in cultivation (since 1870) they have attained a very high rank as a garden plant, being numbered among a dozen plants to have special societies and

exhibitions, both in Europe and America. Besides the cactus forms, which are less formal than the earlier double varieties, there are many forms and sizes ranging in color from white to yellow and deep red, but deficient in the shades of blue.

The plants may be propagated by seeds for obtaining new varieties, by division of the underground parts, or commercially, by cuttings. They succeed well in almost any good soil, the tubers or the young plants being set in beds as soon as danger from frost is past. When frost has killed the tops in the autumn the plants are dug and the tubers stored in a cool, dry cellar until spring, or until they are needed for obtaining cuttings, when they are placed on greenhouse benches and forced. Few pests attack the plants.

Consult: Bull. No. 47, Missouri Experiment Station; Peacock, 'The Dahlia,' and other literature mentioned in article 'Dahlia' by Bailey in 'Cyclopedia of American Horticulture' (New York 1900–2).

Dahlin, dā'lĭn, a white substance, also called inulin, obtained from the pounded tubers of the dahlia. The juice is pressed from the tubers, clarified by standing, mixed with an equal bulk of strong alcohol, filtered, and then with two other volumes of alcohol. Inulin precipitates, and is washed and dried. It is a white starchy powder, with distinct crystalline character; it has no taste or smell, is hygroscopic, but sparingly soluble in water, until it passes into a non-crystalline modification. The tubers pounded and distilled with water yield a strongly smelling, sweetish ethereal oil, which is heavier than water, but becomes buttery and semi-crystalline in it. The tubers also contain a fixed oil and salts of organic acids. The coloring matter of the purple dahlia is very sensitive to acids, which turn it red, and to alkalies, which turn it green. When extracted by water or alcohol, and paper steeped in it, it forms Georgina paper, and is used as a chemical test instead of red and blue litmus paper.

Dahlmann, Friedrich Christoph, frēd'rĭH krĭs'tōf däl'män, German historian: b. Wismar 13 May 1785; d. Bonn, Prussia, 5 Dec. 1860. He studied at Copenhagen and Halle; in 1812 was appointed professor extraordinary of history at Kiel, and in 1829 accepted a call to fill the chair of political science in the university of Göttingen. There he continued his historical studies, but did not on that account altogether abandon the domain of politics. He contributed in great measure to the establishment of the constitution of Hanover in 1833, and was a vigorous advocate of liberal principles. In 1842 he was appointed to the chair of history in the university of Bonn, where he gave himself up entirely to literary pursuits. The revolution of 1848 recalled him to public life. He was sent as a deputy to the diet of the confederation, had a share in elaborating the constitution called that of the "Seventeen," and became one of the chiefs of the constitutional or parliamentary party. He was afterward a member of the Prussian chamber of deputies, in which he set himself to withstand the reactionary movement which followed the troubled period of 1848–9; but finally renounced politics entirely, and devoted the remainder of his life to literature. He left a large number of works, all characterized by great depth, an accurate understanding of the events he relates, and a thorough knowledge of men. Among these are his 'Quellenkunde der deutschen Geschichte' (1830); 'Geschichte Dänemarks' (1840–3); 'Geschichte der englischen Revolution' (1844); and 'Geschichte der französischen Revolution' (1845). See Springer, 'F. C. Dahlmann' (1870–2).

Dahlonega, dä-lŏn'ę-gą, Ga., county-seat of Lumpkin County, about 20 miles north by west of Gainesville, on one of the branches of the Chattahoochee River, among the foothills south of the Blue Ridge Mountains. It is the seat of the Georgia Agricultural College. The town is the centre of the richest gold mining region east of the Mississippi River. The town was first settled in 1831 by gold miners. The principal industries are those connected with the mining and refining of gold. Pop. (1900) 1,255.

Dahn, dän, **Julius Sophus Felix,** German historian: b. Hamburg 9 Feb. 1834. He was professor of jurisprudence successively in the universities of Munich, Würzburg, Königsberg, and Breslau. Among his historical works are 'The Kings of the Germans' (1861–71); 'Geschichte der deutschen Urzeit' (1883–8). He is the author of many tractates on the jurisprudence of the ancient Germans, and the civil and criminal law and procedure of modern German states. He has also written epics and lyrics. Of the former may be named 'Herald and Theano' (1856); of the lyrics, 'Ballads and Songs' (1878). He is author also of the dramas: 'König Roderich'; 'Sühne'; etc., as well as several romances.

Dahomey, dä-hō'mī or -mā (native name of the people, *Dauma* or *Dahomé*), a French protectorate in western Africa, bounded on the east by the British possessions of Nigeria and Lagos, on the south by the Gulf of Guinea, on the west by Togoland (German), and on the north by the French military possessions; area about 60,000 square miles, having been increased in 1900 by territory in the north, adjacent to the Niger. The coast line is only about 70 miles in length. About midway on the coast lagoon is the port of Whydah, whence a road extends inland to Abomey, a distance of 65 miles. Dense forests and dismal swamps cover nearly two thirds of this distance, but from the Great Swamp of Agrimé vast undulating plains rise for many miles in the direction of the Kong Mountains. The Avon and Denham lagoons receive the rivers, which are not very important. The soil is extremely fertile. Among native trees are the baobab and the cocoanut palm. Groves of oil-palms encircle each town, and palm-oil is made in large quantities. Maize, beans, and peas, as well as cassava, yams, sweet potatoes, limes, oranges, pineapples, and other tropical fruits grow in luxuriance; cotton, sugar, and spices of all kinds are also grown, and sheep, goats, swine, and poultry are raised, though not in large numbers.

In 1901 the imports, which consisted chiefly of liquors, tobacco, and cotton goods, were valued at $3,150,130; and the exports, which were chiefly palm-oil and palm kernels, $2,095,763. Some cotton cloth is made in the country, and weapons and tools are forged from native iron. There are few roads in the country.

1902 a railway was constructed from the port of Kotonu into the interior. A telegraph line connects that port with Abomey, the Niger and the Senegal. There were 950 miles of telegraph and 100 of telephone line in 1903. The currency consists of cowrie shells and French, English, and American coins. The colony is administered by a lieutenant-governor with an administrative council.

Daibutsu, dī-boo'tsoo, the name given in Japan to a gigantic statue of Buddha. The largest Daibutsu in the empire is found at Nara (q.v.). It is 53 feet high and supposed to date from the 8th century. The image is shrined in a pagoda. At Kamakura (q.v.) is a bronze Daibutsu over 40½ feet in height. The eyes, which are four feet long, are made of gold.

Daillé, Jean, zhŏn dä-yā, French Protestant theologian: b. Châtelherault 6 Jan. 1594; d. Charenton, near Paris, 15 April 1670. He became pastor in 1625 of the church at Saumur, and in 1626 of that of Charenton at Paris, where he passed the remainder of his life. He was one of the ablest and most learned divines of his day, and did essential service to the Protestant cause by several works, among which the most celebrated is entitled 'Traité de l'emploi des SS. Pères pour le Jugement des Différends de la Religion' (1632). It was also published in Latin and translated into English, and in both forms has had a very extensive circulation both in England and on the continent. It aims to show that the authority of the fathers has been far too much overvalued, and that the ignorance or inaccuracy apparent in almost all their works unfit them for the establishment of any doctrine not clearly laid down in Scripture. He also wrote distinct treatises on several of the leading points of controversy between Protestants and Roman Catholics.

Daimiel, dī-mē-ĕl', Spain, town in the province of Ciudad Real; about 20 miles east-northeast of the town of Ciudad Real on the Azuer River. It is well built; the principal edifices are two parish churches, the one Gothic, the other Doric, and both surmounted by towers. The manufactures consist chiefly of linen and woolen fabrics, and lace, and the trade is chiefly in grain, cattle, wine, and wool. Pop. 11,850.

Daimios, dī'mē-ōz, a class of feudal lords formerly existing in Japan, but now deprived of their privileges and jurisdiction. As long as their feudal possessions remained to them, they exercised in their own domains the rights of petty rulers, and 18 of them were to all intents and purposes independent; a circumstance which greatly limited the power of the mikado, and formed a hindrance to the career of progress and reform on which Japan had entered. In order to centralize the power of the government, a decree was issued on 12 Aug. 1871 by which the daimios were deprived of all rights of sovereignty, their districts incorporated with the imperial territories, and their troops handed over to the imperial government. At the same time a new constitution and organization were given to the state. A deliberative assembly, consisting of two chambers, was created, to which deputies were sent by the former feudal governments or districts of the daimios (Han); and the daimios themselves were made official governors of those districts which they previously held as feudal rulers, and were placed upon a salary hereditary in their families. Their salaries now equal one tenth of their former income.

Daiquiri (dăc-ke ree'), a town lying about 15½ miles southeast of Santiago, on the southern coast of Cuba. The American army of invasion, excepting Kent's division, made (22 June 1898) a successful landing at this place. See UNITED STATES: **The War With Spain.**

Dair-el-Kamar, dīr-ĕl-kä'mär, Syria, the chief town of the Druses, on a slope of Mount Lebanon, 12 miles southeast of Beirut. It is accessible only by two narrow paths. The only remarkable buildings are a large khan, a palace which formed the old serai of the emir of Lebanon, a Maronite convent, and several churches. Pop. 8,000.

Daircell, Saint, said to have lived in Kerry, Ireland, in the 7th century. The legend is that he was the illegitimate son of a husbandman, and that the mother sought to kill the child at birth. A fluttering white dove, which seemed to descend from heaven, stayed her hand, and saved the life of the babe.

Dairy Cattle, the name given to the neat cattle raised for their milk, rather than for their flesh, the latter being called beef cattle. Man has, by careful attention, prolonged the natural period of milk-flow and increased the quantity much beyond the needs of the calf. This is drawn from the cow by the milking process familiar to most people; and the value of the cattle depends upon the quantity and richness of the milk produced, more than upon any other feature. Naturally, however, the more robust breeds, and those that can do well on comparatively coarse food, are most useful in certain sections of country subject to extremes of temperature, and producing inferior fodder-grass.

Though dairy cattle are bred almost all over the civilized world, the stock of the best breeds comes from the British Isles, Holland, and Switzerland, the two last named countries being justly famous for their rich milk and fine cheese.

In America, almost all breeds of cattle are represented, and experiments have been made and statistics gathered under the supervision of government, as to the breeds that thrive best in the various agricultural districts. According to the reports of the United States Department of Agriculture these are the Brown Swiss, which, as its name signifies, is of Swiss origin; the Dutch Belted, and Holsteins, two breeds from Holland; and the Ayrshire, Devon, Guernsey, Jersey, and various breeds of Durham from Great Britain.

Dairy cattle are usually somewhat less heavy than beef cattle; and, except in rare cases, are extremely gentle. They should be well cared for, and kept in as cleanly a manner as possible, as such care is fully repaid by both the amount and condition of the milk produced.

The Brown Swiss is a breed of medium size, fleshy, well-proportioned, with a straight, broad back, heavy legs and neck, and a somewhat coarse appearance. Despite this, however, these cattle are rather small-boned, have fine silky coats, and rich elastic skin. The color is brown, shading into a soft mouse color, or dun, on the body, with head, neck, and legs very dark, often almost black. The nose, tongue, hoofs, and switch are quite black. There is a light-colored stripe around lips and nostrils, a tuft of light

hair between the horns, and a similarly colored stripe along the tail. The eyes are full, gentle, very bright, and usually black. The small horns are white, tipped with black, and curve forward and inward. The ears are good-sized, and round, and lined with light-colored, silky hair. The udder is large, and quite white. The average weight is from 1,200 to 1,400 pounds, the bulls sometimes attaining greater size and weight. Both bulls and cows are hardy and active, and, owing to their origin, thrive well in mountainous regions. The bulls are just as docile as the cows, and even in big herds, are easily managed.

The Dutch Belted are gentle, vigorous cattle, with rather longer legs and less bulky bodies than other breeds, and are easily known by the broad belt of white encircling the body, between hips and shoulder blades, forming a marked contrast to the jet-black, glossy coat of the remainder of the body. No white should appear on the black portion, and on the white belt there should be no black spot.

The second Dutch breed, the Holstein-Friesian, is characterized by great size, and by the black-and-white coat. The ground-color is usually jet-black, of a silken texture, with marks of pure white upon it. These do not merge gradually into the black, but are clearly outlined patches. The horns are small, usually white, tipped with black. The tail is tipped with a white brush. Though the largest and heaviest of dairy cattle, the Holsteins are not so easily satisfied with coarse food, nor so hardy as many other breeds; and they are large feeders.

The British breeds are varied. The Ayrshire is the breed best suited to rugged uplands, pastures, and inclement weather. These cattle, generally under the average in weight, are short-legged, small-boned, and alert. The horns are gracefully curved, generally upward; the eyes are unusually bright. The color is red and white in spots; the red sometimes varying to a rich brown. The coat is always glossy; and the intelligence, economy, and large yield of milk make this a favorite breed.

The Devon, considered the most beautiful of dairy breeds, is a red-coated, smooth-skinned animal, active, hardy, symmetrical, and intelligent. Though the typical red may vary in tone, being sometimes pale, sometimes dark, no markings of white or black appear, save one patch of white on and in front of the udder. The females have beautiful, creamy, black-tipped, pointed horns, curving upward. The males have shorter, thicker, and less graceful horns.

Guernseys, as their name signifies, originated in the island of Guernsey in the English Channel. They are yellowish in color, often with patches of white on the body and legs. The ground color is deepened almost to brown in many cases. The horns are small, fine, and graceful, often yellowish from the base. This breed secretes a large amount of yellow coloring-matter, noticeable in the animals themselves, and very prominent in the golden color of the butter made from their milk. Guernseys are nervous, and yet with care may be kept quite gentle.

The Jerseys, from the same group of islands as the former breed, are smaller than any other breed of dairy cattle. In color these animals are rather variable, ranging through shades of brown to black, yellow, tan, or cream, either solid color, or broken, patches often being white. The horns are small and crumpled, the eyes soft and gentle. Jerseys are much less fleshy than most other breeds, and are sharper in outline. They are light, quick, and rather graceful in motion; and are second only to Guernseys in the richness and color of their milk. There is an unmistakable, though indefinable, air of breeding about a Jersey that invariably shows.

The Durham cattle are of various breeds. They are all short-horned or quite hornless; are red in color, sometimes marked with white; have heavy bodies, and short, broad heads. They are usually classed as beef cattle; but are so capable of giving good milk in large quantities that they are often bred for dairy purposes. They are exceedingly docile, even the great bulls, which attain a weight of 2,500 to 3,000 pounds, being thoroughly domesticated.

Dairy Industry, American. Compared with other farming and agricultural industries in the United States, dairying is one of considerable import and shows great development during the last two or three decades. The industry is most prominent in sections where natural advantages are the greatest. According to government statistics, the leading dairy States are Vermont, Connecticut, Massachusetts, New York, New Jersey, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Iowa, and Minnesota. Butter is made in all these States, while New York, Wisconsin, and Ohio are the heaviest producers of cheese, the varieties including imitations of many foreign cheeses. Dairy farms are rapidly developing in sections where wheat and other "general" crops have become unprofitable. The industry has recently made great advances in North and South Dakota, Nebraska, Kansas, Missouri, and the Pacific Coast States, also in the Southern States where only a few years ago it was hardly known. The old belief, that dairy operations could be carried on only within narrow limits, comprising those few States wherein the industry originated in this country, exists no longer. It has been proved that cows can be kept and good butter and cheese can be made in almost any district where suitable coarse fodder can be produced. It is often possible to grow more abundant and better fodder crops than are furnished by the natural grasses. Well or cistern water may take the place of the flowing spring. Freight rates and fast refrigerator-car transportation lines have the effect of placing the distant dairyman near the markets where grains can be purchased and his products can be disposed of to the best advantage. Dairying seems to be the one branch of agriculture least affected by conditions of soil and climate.

Dairying has many advantages over other kinds of farming. It improves the land instead of wearing it out, because the products of the dairy which leave the farm permanently are not rich in plant food, as is the case with field crops, and it provides fertilizer in the form of manure which is of immense value for enriching poor soil. It furnishes a profitable way of using certain farm products, such as grass and straw, that otherwise would be valueless. It provides a cheap by-product in the form of skimmed milk or whey, which can be very profitably fed to calves and other animals. It can be combined

with other forms of agriculture. Perhaps best of all, it engages the farmer in paying work for the entire year. It is for these reasons that the general appearance of any section where dairying is extensively followed, is one of thrift and progress. The growth of the dairy industry is sometimes checked temporarily by unfavorable economic conditions, such as high cost of feeds and high prices of beef, as well as by overproduction of dairy products.

The United States census for 1900 gives the following dairy statistics:

Cows on farms and ranges	17,139,674
Cows in towns and cities	973,033
Total cows in the United States	18,112,707
Total milk produced, gallons	7,728,583,350
Butter made on farms, pounds	1,071,745,127
Butter made in creameries and urban establishments, pounds	420,954,016
Total butter, pounds	1,492,699,143
Cheese made on farms, pounds	16,372,330
Cheese made in factories and urban establishments, pounds	282,332,774
Total cheese, pounds	299,006,818
Creameries and cheese factories, number	9,355
Average annual yield of milk, per cow, gallons	424

Alvord's estimates for 1903 are as follows:

Number of cows producing milk to be used,—	
For milk, cream and condensed milk	6,400,000
For making butter (151½ pounds each per year)	10,900,000
For making cheese (356 pounds each per year)	840,000
For rearing calves	860,000
Total cows, estimated	19,000,000

The aggregate annual value of dairy products is estimated to exceed $500,000,000. Exports of dairy products have always been small, as the great market for them is at home. The demands of foreign markets differ somewhat from domestic requirements, and as the latter are observed almost universally by makers of butter and cheese, an explanation is thus furnished of the fact that these products do not enjoy the highest reputation abroad. That butter and cheese which will fully satisfy foreign tastes can be supplied from this country has been proved many times by experience of exporters as well as by trial shipments made by the Department of Agriculture. There are great possibilities for American dairy products in other countries, and these will be developed as soon as our production is permanently in excess of our needs. During recent years the annual exports of butter have seldom exceeded 25,000,000 pounds, and those of cheese 75,000,000 pounds. The quantities and values exported (principally to Great Britain) in the fiscal year 1902 were: Butter, 16,002,160 pounds; value, $2,885,609; cheese, 27,203,184 pounds; value, $2,745,597. Through the efforts of a few American manufacturers of condensed milk an excellent grade of this article is rapidly becoming established in the world's markets. The value of condensed milk exported in the fiscal year 1902 was $1,473,564.

The best and most profitable breed of dairy cattle has as yet never been agreed upon. Each of about half a dozen different breeds has strong claims to highest merit and each has its enthusiastic advocates. The latter are often influenced by conditions which have no economic importance. Different breeds differ markedly in certain characteristics such as size, color, and disposition, as well as quantity and quality of milk. As a general rule, when a large amount of milk is given, it is low in fat-content or "richness." Interesting data regarding several leading dairy breeds of cattle have been compiled by Woll as follows:

Breed	Cows included	Lactation periods	Average yield per lactation period: Milk	Average yield per lactation period: Butter fat	Average fat	Average cost of: food eaten per day	Average cost of: producing 100 lbs. milk	Average cost of: producing 1 lb. of fat
	No.	No.	Lbs.	Lbs.	Per c't.	Cts	Cts	Cts
Ayrshire	10	20	6,009	248 5	3.60	14 5	78 5	21 5
Devon	3	5	3,984	183 3	4.60	10 3	94	20 5
Guernsey	8	10	6,210	322 0	5.2	13 5	82 5	15 8
Holst'n-Fries'n	9	10	8,215	282 0	3.43	17 2	74 7	21 5
Jersey	9	18	5,579	301 1	5.40	13 9	94 7	17 4
Shorthorn	4	5	8,090	345 4	3.97	14 3	78 7	19 4

There is a wide variation in the milk production of different cows of any breed. Yields of milk amounting to 10,000 pounds (two and one seventh pounds to one quart) in one year are not rare. They are exceeded even by some Jerseys and Guernseys, whose milk is always of high quality. Records of over 20,000 pounds are credited to Holsteins, whose milk tests considerably lower in fat. The great majority of dairy cows throughout the country are "grades," that is, their blood represents different breeds and in no definite proportions. As producers of milk, individual grade cows can be selected that will equal thoroughbred animals, but the latter are more satisfactory for breeding purposes. Farrington reports a high grade Shorthorn cow in Wisconsin that gave in one year 11,131.7 pounds of milk containing 500 pounds of fat, an equivalent of 584 pounds of butter. The total feed consumed in the year cost $39.60. The total value of her butter and skimmed milk was $131.83. The cost of feed consumed for every pound of butter produced was only 6.7 cents. Too often the value of the annual product of a cow is very low,— even less than $25.00. It is a fact that on account of lack of business methods many such cows are kept at an actual loss to their owners.

Dairymen are divided upon the question as to the merits of the "single-purpose" and "dual-purpose" animals. The latter include those that can be profitably disposed of for beef when their period of usefulness in the dairy is ended. Advocates of the former think this advantage is purchased at a high cost and that the single-purpose cows are enough more profitable while in the dairy herd to permit of their final disposition at a low figure.

Milk of the cow is secreted in the mammary glands known as the udder. Wing thus well describes the udder of a good cow: "It should be large and well developed; it should occupy the whole space between the hind legs, extending well up between the thighs and well forward upon the belly. It should be held firmly against the wall of the abdomen. It should be level or nearly so on the bottom, and the four quarters should be as nearly as possible equally developed and each furnished with a cylindrical perpendic-

ular teat of moderate length. The whole organ should diminish rapidly in size, as the milk is withdrawn. The hair upon the udder should be fairly abundant, fine and soft, and abundantly supplied with brownish dandruff." As milk is a product of the blood, the importance of an ample blood supply to the udder, a vigorous constitution and a strong circulation is readily seen. It is highly important to withdraw the milk from the udder regularly, quietly and completely if the flow is to be maintained.

Van Slyke gives the average of 5,552 American analyses of cow's milk as follows:

Water	Total Solids	Fat	Casein	Albumin	Sugar	Ash
87.10	12.90	3.90	2.50	0.70	5.10	0.70

In addition to the constituents named, certain others are present in minute quantities. The average specific gravity of milk is 1.032. The composition of milk of different cows varies between wide limits. The same may be true of the product of any individual cow from day to day. The New York Agricultural Experiment Station is authority for the following averages of analyses of milks from cows of different breeds:

Breed	No. Analyses	Water	Total Solids	Solids not fat	Fat	Casein	Milk Sugar	Ash	Nitrogen	Daily Milk Yield
Ayrshire	252	86.95	13.06	9.35	3.57	3.43	5.33	0.698	0.543	18.40
Devon	72	86.26	13.77	9.60	4.15	3.76	5.07	.760	.595	12.65
Guernsey	112	85.39	14.60	9.47	5.12	3.61	5.11	.753	.570	16.
Holst'n-Fries'n.	132	87.62	12.39	9.07	3.46	3.39	4.84	.735	.540	22.65
Jersey	238	84.60	15.40	9.80	5.61	3.91	5.15	.743	.618	14.07

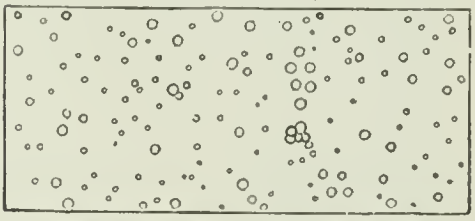
Koenig gives the variations of milk constituents in about 800 samples as follows:

	Maximum	Minimum
Water	90.69	80.32
Fat	6.47	1.67
Casein	4.23	1.79
Albumin	1.44	.25
Sugar	6.03	2.11
Ash	1.21	.35

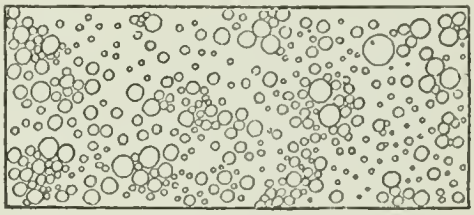
In some instances American analyses have found even wider variations.

The most variable constituent of milk is fat. By it the "richness" of milk is judged and the commercial value is determined. Milk fat is a complex mixture containing several glycerine compounds. It is present in the form of minute globules suspended in the remaining or watery portion called the serum. The globules average about one ten thousandth of an inch in diameter and are plainly visible under a high power microscope. About 150,000,000 of them are contained in a single drop of milk. Some conditions affecting fat-content of milk have already been mentioned. There are a few others of importance. From about the middle to the last of the period of lactation, the fat in milk slightly increases. The percentage of fat increases gradually from the first to the last of any milking; the first milk drawn contains about 1 per cent fat and the last as high as 9 or 10 per cent. It is popularly supposed that the feed given a cow has a decided influence on the quality of her milk. As a matter of fact, the milk of a cow in normal condition is little affected in this manner. Feed has a much greater influence upon the quantity of milk than its quality. Casein and albumin are proteid or nitrogen constituents of milk. The former is coagulated by rennet or acid, the latter by heat. Coagulated casein or "curd" enters largely into the composition of cheese. Casein is said to be in a state of "pseudo-solution" in milk. Milk sugar or lactose is in solution in milk. When separated it resembles powdered sugar. It is less sweet than cane sugar and is used to a considerable extent in druggists' preparations and in certain proprietary foods. The mineral matter in milk, called ash or salts, is the part remaining when milk is evaporated to dryness and burned. It includes phosphorus, potassium, calcium, chlorine, magnesium, sodium, sulphur, and iron. Certain gases and other constituents are present in milk in minute quantities.

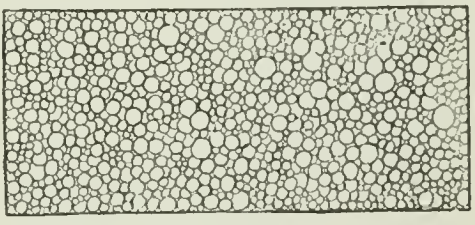
a. Skimmed milk.



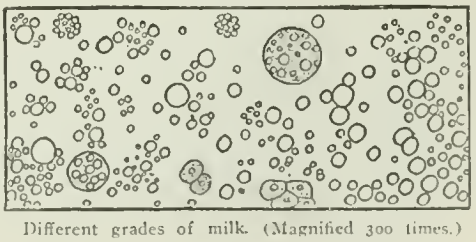
b. Milk.



c. Cream.



d. Colostrum.



Different grades of milk. (Magnified 300 times.)

The first milk given after parturition is called colostrum. It differs in composition from nor-

mal milk, and is fit only as food for the newly born calf.

The only precise method of determining the quality of milk is by a complete gravimetric analysis, but for practical purposes the knowledge of the specific gravity of milk and its fat-content is usually sufficient. The specific gravity can be quickly ascertained by the use of a lactometer, and the fat-content can be more or less accurately determined in a few minutes' time by any one of several quick tests. Of these the one in most general use and the most satisfactory is the Babcock test invented by Dr. S. M. Babcock of the University of Wisconsin. A definite amount of milk is mixed with sulphuric acid in a special bottle having a graduated neck. This is rapidly whirled in a machine and the fat is separated from the rest of the mixture by centrifugal force. By the addition of water the fat is brought up into the neck of the bottle, where its exact percentage can be read. Simple tests have been devised for determining the acidity of milk, and whether or not it has been heated.

Milk is a very delicate product and is subject to taints and changes in great number. It readily absorbs strong odors with which it comes in contact, and it is easily given objectionable flavors when the cows are allowed to eat certain foods within a few hours before milking. The flavors caused by garlic and rag-weed are well known; rape and green rye are claimed to produce bad flavors in the milk when they are fed in certain conditions. Flavors due to the causes named are most noticeable when the milk is first drawn from the udder, and may be largely reduced by aëration or the exposure of milk to the air. When held, milk undergoes many different kinds of changes. The most common is souring, but it may become slimy or "ropy," curdle without souring, become "soapy," turn to a red, blue, or other color, develop peculiar and disagreeable odors, form poisonous products, or become altered in other ways. Most of these changes are directly due to bacteria, but some are caused by enzymes or unorganized ferments. Bacteria find in milk an exceptionally favorable medium for growth. There are so many ways by which they enter that it is a practical impossibility to produce milk which is germ-free. But the character and number of the bacteria that get into milk and their development are largely controllable and have much to do with the success or failure of all operations with milk and its products. Many species of bacteria found in milk are perfectly harmless. Some are essential to certain dairy operations, for example, when it is desired to ripen cream to make butter, lactic acid bacteria are needed; they produce lactic acid from milk sugar and cause the milk or cream to sour. Other species have their peculiar effects in the ripening processes of the various forms of cheese. Numerous varieties of bacteria are objectionable and some are dangerous. The latter include pathogenic bacteria and other forms that may be the direct or indirect cause of disease to the consumer. Well authenticated cases are on record of typhoid fever, diphtheria, and other disease germs being carried by milk and there seems to be proof that tuberculosis is sometimes spread in this manner.

The number of bacteria ordinarily found in milk varies from a few thousand to more than a million per cubic centimetre. Most of the organisms entering milk are carried there by particles of dust, dirt, and foreign matter that fall into the milk from the attendants' hands and clothes, from the hairy coat of the cow and from the dust-laden atmosphere. Another fruitful source of contamination is furnished by milk utensils that have not been thoroughly cleaned. Bacteria thrive best at temperatures between 80 and 100° F. They grow slowly when the temperature is below 60° and there is very little development at temperatures below 45° F. Different methods of reducing bacteria in milk by removing them or killing them are in use. But these methods are only means for somewhat improving undesirable conditions which should have been prevented. When the bacterial content of milk is high because it contains considerable dirt, it can be somewhat reduced by filtering the milk through sand, cotton, or felt, or by passing it through a separator and recombining the streams of cream and skimmed milk. Certain chemicals of a disinfectant nature are sometimes put into milk for the purpose of destroying germ life. They are known as preservatives and the ones most commonly employed are salicylic acid, boracic acid, and formalin. Their use is highly objectionable and in some States and cities they are prohibited by law. Without doubt they inhibit the growth of bacteria, but there are reasons for believing they also reduce the food value of the milk. To a limited extent and for special requirements, milk is sterilized before use. Sterilization means the destruction of *all* germ life, and to accomplish this the milk must be heated to a high degree, sometimes above the boiling point, the exact temperature depending upon the resisting power of spores that happen to be present and the time of exposure. Or it must be treated by a method of intermittent heating, which is objected to on account of the successive heatings and coolings and the amount of work involved. It is generally believed that the digestibility and food value of milk are greatly reduced by subjecting it to high heat. The pasteurization of milk, by which most of the germs are destroyed by exposure to a comparatively low degree of heat, is favored by many authorities, especially when good, clean milk of low bacterial content cannot be secured. Exposure to 150° F. for 30 minutes followed by rapid and thorough cooling is a common practice. There is no definite rule about degree of heat and length of exposure, but the greater the heat and the longer the time, the more germs are destroyed. It is claimed that bacteria can be reduced from many thousand to less than one hundred per cubic centimetre by holding the milk at 156° F. for 30 minutes. Of course the keeping quality would thus be much improved. At about the temperature last named the milk albumin is coagulated and a cooked taste is acquired, hence that degree of heat is rarely exceeded in commercial work. The pasteurization of market milk is not a general practice, but it is gradually increasing. One of the chief objections to pasteurized milk may be stated. It is known that when several species of bacteria are growing in the same medium, some may retard or prevent the growth of others. When milk is heated and the more numerous forms of bacteria are killed a chance *may* be given to some dangerous form not affected by the degree of heat used, to multiply rapidly without restriction and thus to cause serious





1. Stalls in a Modern Sanitary Cow Stable.

2. Cows in a Model Sanitary Stable.

results. When cream is pasteurized it becomes thin in appearance, but its "body" can be restored by the use of a lime preparation called "viscogen."

The successful management of a dairy requires great intelligence, patience, and persistence, and no person should expect to succeed in this business unless he has a decided liking for it. Of course the matter requiring first attention is the location of the farm. The elevation and conformation of the land should be such that good air and drainage would obtain. There should be an abundant supply of pure water. For this purpose a well-protected spring or deep well is best and care should be taken to have it located distant from buildings and other possible sources of contamination. Barns and dairy buildings should stand on elevated ground and they should be isolated from other structures. It is well to store all forage in a building separate from the cow stable. By a system of overhead tracks and suspended cars, feed can be easily brought to the herd and manure economically removed. Unless the manure can be spread at once upon the land, it should be stored under a roof. The stable should be planned to facilitate the work of caring for the herd. Light and fresh air are necessary and should be admitted in abundance. It is generally advised that there be allowed at least one cubic foot of space for every pound of live weight. Where the winters are not too cold and expense of construction must be kept low, the cows may be allowed to stand on the ground, the floor of the barn being made from hard packed clay or earth. Better floors are made from planks treated with tar and laid close together. A cement floor is the best, but because of its hardness an abundance of bedding must be used. The stalls should be from three and a half to four feet wide and just long enough so that when the cow is standing, the manure gutter will be immediately back of the hind feet. Many devices for tying cows have been proposed, but one of the most satisfactory is the stanchion attached above and below by a few links of chain, so as to allow some freedom of motion in all directions. A separate feeding box for each animal is objectionable because of the difficulty of keeping it clean. At many of the best dairies the cows are fed on the floor, a long shallow trough in front of the stalls being constructed for this purpose. Provision should be made for frequent access to water. Milch cows should be allowed to go out doors every pleasant day for exercise.

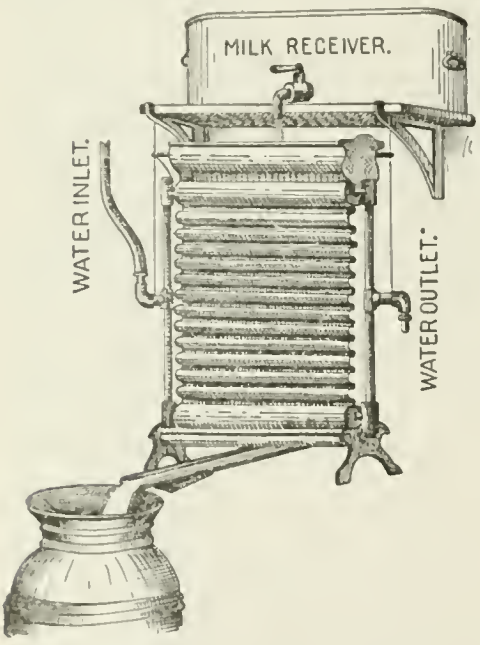
The selection of cows for a dairy herd, regardless of the breed chosen, should be based upon individual merit. Small and unprofitable producers as well as unhealthy cows and those of weak constitution should be avoided, and when they are found in the herd, advantage should be taken of the first opportunity to displace them. It is well said "the bull is half the herd." When calves are to be raised, as is the rule in most dairies, the influence of the bull upon the development of the herd is readily seen. If possible a bull of proved excellence should be used. It is always well to give special attention to the breeding of the bull and attach considerable importance to the performances of his dam and grand-dams. The quantity of milk given by each cow, and its fat test, should be recorded at least one day every two weeks for the purpose of showing which animals of the herd are profitable and which are not. The time for breeding cows depends upon the requirements for milk. Formerly it was the general practice in dairies not supplying milk for retail sale to have cows calve in the spring and be "dry" throughout the winter. At the present time, however, a large number of dairies are operated most profitably during the winter for the purpose of supplying milk for butter and cheese making, as well as for consumption in towns and cities.

Feeding for best results is a subject which requires much study and experience. Especially is this the case where winter dairying is practised. In the first place feed should be wholesome and palatable. Then care should be taken to have the nitrogenous and non-nitrogenous components properly proportioned. Just what feeds will be used depends largely upon local conditions, cost, availability, etc. Practical rations as fed in different parts of the country and reported by Woll are as follows: New York, 20 pounds hay, 2 pounds wheat bran, 2 pounds cotton-seed meal, 2 pounds hominy meal. Vermont, 30 pounds corn silage, 10 pounds hay, 4.2 pounds corn meal, 4.2 pounds wheat bran, 8 pounds linseed meal. Wisconsin, 26 pounds corn silage, 10 pounds clover hay, 5 pounds timothy hay, 8 pounds wheat middlings, 1½ pounds oil meal. Most coarse fodders are low in nitrogenous component or protein; of these, the leguminous plants contain the highest percentages of protein. The concentrated feeding stuffs commonly used and containing the most protein, are cotton-seed meal, linseed meal, gluten meal, dried brewer's grains, wheat middlings, and wheat bran.

Changes in methods of feeding which are especially marked at the present time include the growing use of ensilage and the increasing practice of "soiling" or cutting green feeds of different kinds and bringing these to the animals instead of allowing them to graze.

Milk should be produced and handled in such a manner as to keep bacterial contamination as low as possible. The practical way of accomplishing this is to observe the utmost cleanliness in all the stages of production, to cool the milk at least to 45° F. promptly after it is drawn and to hold it continuously at such low temperature. As pathogenic or disease-producing bacteria are the most dangerous of all forms ever found in milk, special care should be taken to exclude them. For this purpose it is necessary to give close attention to the health of the animals and all persons having to do with the herd or the milk. Serious outbreaks of disease have been due to the handling of milk by persons suffering only mildly with a contagious disease such as typhoid fever or who have been exposed to the disease. Dairy cows should be examined at least three times every year by a competent veterinarian; some of the best dairies have examinations more often. The milk of a cow suspected of being out of condition or not in good health should not be used. By far the largest number of bacteria that enter milk are carried by small particles of foreign matter, such as manure, dust, dirt, hairs, etc. Of course these are most abundant in illy-kept barns where milkers as well as the cows and their surroundings are allowed to be unclean. Barns should be kept thoroughly clean. The use of pine shavings for bedding contributes much to

cleanliness and they are now found in many of the best dairies. Barns should be so constructed and the work should be so planned that there would be no occasion for unnecessary dust in the atmosphere at the time of milking. Milch cows should be 'groomed' daily, and udders should always be cleaned just before milking, with the aid of a brush and a damp cloth. As bacteria are liable to be especially numerous in the milk nearest the teat opening, it is a good practice to discard the first few streams drawn. The operation of milking should be performed in a quiet manner. Freeman has shown that the milk drawn by a man who violently agitates the udder may contain 10 times as many bacteria as that drawn by a quiet milker. Milk should not be used until the fourth or fifth day after calving. In addition to being in good health and avoiding exposure to contagion, the attendants in a dairy should be personally clean. Too often this important matter is overlooked and milk is considerably infected by germs from dirty garments and dirty hands. A special clean suit should be put on and hands should always be thoroughly cleaned before milking. The practice of "wet" milking is extremely filthy. All dairy utensils should



Milk cooler and aërator for use with running water.

be simply constructed and easily cleanable. They should not be made of any open or porous material such as wood. Immediately after use they should be cleaned and then sterilized by boiling water, or better, steam. Milk should be promptly removed from the stable, strained, cooled, and cold-stored. It should be handled in a room specially fitted for the purpose,—fresh, clean, and light. A good form of strainer is provided with the usual wire gauze of fine mesh and a double thickness of sterile cheese cloth filled between with pure white sterile cotton. The cloth and cotton should be changed as often as they commence to show dirt near the lower surface. The usual cooling device serves also as an aërator and consists of an aparatus made of thin metal and so arranged that cold water is on one side while the milk being cooled passes over the other. By certain forms of coolers, it is found entirely practicable to quickly bring the temperature of the milk to within 2 to 4° of the temperature of the water. After cooling, milk should be placed in cans or jars, as may be required, and held at a low temperature continuously until used. Recently it has become the practice in a few places and to a limited extent to put milk intended for consumption into glass jars and seal it within a few minutes after it is taken from the cow, and then cool it. This seems to be satisfactory when the milk is exceptionally pure and in no need of aëration. When milk is to be used for butter and cheese making it is not necessary for it to be held at so low a temperature as when it is to be used for retail trade, for the reason that the development of a certain amount of acidity is desirable. This is fortunate for dairymen who happen to have neither cold springs nor ice. Their milk may be delivered to the butter and cheese factory while perfectly fresh, but as high as 80° F., and yet be used in the manufacture of the best butter or cheese.

Items that need to be kept in mind and conditions which should be observed in the management of a first-class dairy are summarized in 'Fifty Dairy Rules' composed by the writer and issued by the United States Department of Agriculture, as follows:

FIFTY DAIRY RULES.

THE OWNER AND HIS HELPERS.

1. Read current dairy literature and keep posted on new ideas.
2. Observe and enforce the utmost cleanliness about the cattle, their attendants, the stable, the dairy, and all utensils.
3. A person suffering from any disease, or who has been exposed to a contagious disease, must remain away from the cows and the milk.

THE STABLE.

4. Keep dairy cattle in a room or building by themselves. It is preferable to have no cellar below and no storage loft above.
5. Stables should be well ventilated, lighted, and drained; should have tight floors and walls and be plainly constructed.
6. Never use musty or dirty litter.
7. Allow no strong smelling material in the stable for any length of time. Store the manure under cover outside the cow stable and remove it to a distance as often as practicable.
8. Whitewash the stable once or twice a year; use land plaster in the manure gutters daily.
9. Use no dry, dusty feed just previous to milking; if fodder is dusty, sprinkle it before it is fed.
10. Clean and thoroughly air the stable before milking; in hot weather sprinkle the floor.
11. Keep the stable and dairy room in good condition, and then insist that the dairy, factory, or place where the milk goes be kept equally well.

THE COWS.

12. Have the herd examined at leace twice a year by a skilled veterinarian.
13. Promptly remove from the herd any animal suspected of being in bad health, and reject her milk. Never add an animal to the herd until certain it is free from disease, especially tuberculosis.
14. Do not move cows faster than a comfortable walk while on the way to place of milking or feeding.
15. Never allow the cows to be excited by hard driving, abuse, loud talking, or unnecessary disturbance; do not expose them to cold or storms.
16. Do not change the feed suddenly.

17. Feed liberally, and use only fresh, palatable feedstuffs; in no case should decomposed or moldy material be used.
18. Provide water in abundance, easy of access, and always pure; fresh, but not too cold.
19. Salt should always be accessible.
20. Do not allow any strong flavored food, like silage, turnips, cabbage, and garlic, to be eaten, except immediately after milking.
21. Clean the entire body of the cow daily. If hair in the region of the udder is not easily kept clean it should be clipped.
22. Do not use the milk within 20 days before calving, nor for 3 to 5 days afterward.

MILKING.

23. The milker should be clean in all respects; he should not use tobacco; he should wash and dry his hands just before milking.
24. The milker should wear a clean outer garment, used only when milking, and kept in a clean place at other times.
25. Brush the udder and surrounding parts just before milking, and wipe them with a clean, damp cloth or sponge.
26. Milk quietly, quickly, cleanly, and thoroughly. Cows do not like unnecessary noise or delay. Commence milking at exactly the same hour every morning and evening, and milk the cows in the same order.
27. Throw away (but not on the floor, better in the gutter) the first few streams from each teat; this milk is very watery and of little value, but it may injure the rest.
28. If in any milking a part of the milk is bloody or stringy or unnatural in appearance, the whole mess should be rejected.
29. Milk with dry hands; never allow the hands to come in contact with the milk.
30. Do not allow dogs, cats, or loafers to be around at milking time.
31. If any accident occurs by which a pail full or partly full of milk becomes dirty, do not try to remedy this by straining, but reject all this milk and rinse the pail.
32. Weigh and record the milk given by each cow, and take a sample morning and night, at least once a week, for testing by the fat test.

CARE OF MILK.

33. Remove the milk of every cow at once from the stable to a clean, dry room, where the air is pure and sweet. Do not allow cans to remain in stables while they are being filled.
34. Strain the milk through a metal gauze and a flannel cloth or layer of cotton as soon as it is drawn.
35. Aërate and cool the milk as soon as strained. If an apparatus for airing and cooling at the same time is not at hand, the milk should be aired first. This must be done in pure air, and it should then be cooled to 45 degrees if the milk is for shipment, or to 60 degrees if for home use or delivery to a factory.
36. Never close a can containing warm milk which has not been aërated.
37. If cover is left off the can, a piece of cloth or mosquito netting should be used to keep out insects.
38. If milk is stored, it should be held in tanks of fresh, cold water (renewed daily), in a clean, dry, cold room. Unless it is desired to remove cream, it should be stirred with a tin stirrer often enough to prevent forming a thick cream layer.
39. Keep the night milk under shelter so rain cannot get into the cans. In warm weather hold it in a tank of fresh cold water.
40. Never mix fresh warm milk with that which has been cooled.
41. Do not allow the milk to freeze.
42. Under no circumstances should anything be added to milk to prevent its souring. Cleanliness and cold are the only preventives needed.
43. All milk should be in good condition when delivered. This may make it necessary to deliver twice a day during the hottest weather.
44. When cans are hauled far they should be full, and carried in a spring wagon.
45. In hot weather cover the cans, when moved in a wagon, with a clean wet blanket or canvas.

THE UTENSILS.

46. Milk utensils for farm use should be made of metal and have all joints smoothly soldered. Never allow them to become rusty or rough inside.
47. Do not haul waste products back to the farm in the same cans used for delivering milk. When this is unavoidable, insist that the skimmed milk or whey tank be kept clean.
48. Cans used for the return of skimmed milk or whey should be emptied and cleaned as soon as they arrive at the farm.
49. Clean all dairy utensils by first thoroughly rinsing then in warm water; then clean inside and out with a brush and hot water in which a cleaning material is dissolved; then rinse and lastly sterilize by boiling water or steam. Use pure water only.
50. After cleaning, keep utensils inverted, in pure air, and in as much sunlight as possible, until wanted for use.

Milk is a food of great value. Next to bread and water it is used more commonly than any other article of food or drink. It contains in easily digestible form the four kinds of nutrients required by the body,—protein, fats, carbohydrates and mineral matter. With few exceptions it contains more nutritive matter than can be obtained at the same cost in any other food. Jordan has shown the economy of using milk in the family dietary. The increased use of good wholesome milk is strongly recommended. Skimmed milk also contains considerable food value and could well be used as a human food much more than is the present custom. The average amount of milk consumed daily in cities and towns is about one half pint per capita and to supply this there must be within easy reach one cow for about every 12 persons. Many cows are kept within corporate limits and their product is delivered twice daily,—often "warm from the cow." For best results it should be cooled promptly, but it is generally used before any considerable change takes place. Most of the milk supply of small and medium-sized towns and a large portion of the milk used in cities is taken from the dairy to the consumer by teams, and the general rule is to serve in the morning the product of the same morning and previous evening.

The bulk of the milk used in large cities is transported by special trains and sometimes these originate as far as 200 to 300 miles from their destination. "Train" milk varies from 12 to 48 hours old when delivered to the consumer. Most of it is either 24 or 36 hours old. Producers, dealers, and shippers have learned that milk so long delayed must receive good care, and it often happens that this milk is finally delivered in better condition than milk less old, but neglected. The receipts of milk in New York city are over 1,335,000 quarts daily, and practically all is brought by trains. Milk is usually transported in heavy tin cans holding 8½, 20, 30, or 40 quarts. In recent years bottles have come into use and they are gradually increasing in favor. Some concerns maintain bottling stations near the producing farms, and their product is shipped in glass jars which are packed in cracked ice during hot weather. Much milk is bottled in the cities before delivery.

Farmers usually receive two to three cents per quart for their milk in the summer and one cent more in the winter. City retail prices range from 6 to 10 cents per quart. Most milk is delivered promptly after it reaches the city. When it must be held before delivery a clean, cold place must be provided for this purpose. The best results with milk in cans or bottles is obtained when these are stored in tanks of ice water. Cream cans should be buried in cracked ice. If the products are thoroughly cold they may be held satisfactorily in cold, dry air.

Much is being done by State and municipal governments to improve market milk, but the greatest influence to this end that can be produced is a determined demand on the part of the consumers for pure milk and a willingness to pay for it. Medical milk commissions in a few cities are entitled to credit for good results already obtained. In New York and Philadelphia several concerns are distributing milk which is produced and handled under the supervision of commissions of physicians. These concerns are pioneers and deserving of great credit. It is their aim to produce milk in a scientific manner and to take every reasonable measure to insure its purity. One of them operates in 10 different cities and conducts dairies which are models in cleanliness and management. The same company has developed a large trade in "modified milk," which is milk altered in its composition according to the peculiar requirements of infants and invalids, and specially prepared upon physicians' prescriptions. The comparatively few high-class dairies now in operation are doing much to stimulate a wholesome interest in the subject.

Kumiss is one of the forms of fermented milk used as a beverage. It is produced with the aid of yeast.

The principal American publications on dairying, exclusive of butter and cheese, include the following: Wing, 'Milk and Its Products' (1897); Conn, 'Dairy Bacteriology' (1903); Farrington and Woll, 'Testing Milk and Its Products' (1897); Grotenfelt, 'Principles of Modern Dairy Practice' (1894); Freeman, 'Low Temperature Pasteurization of Milk' (1896); Jones, 'Dairying for Profit' (1894); Monrad, 'Pasteurization and Milk Preservation' (1895); Russell, 'Outlines of Dairy Bacteriology' (1894); Snyder, 'The Chemistry of Dairying' (1897); also 'Hoard's Dairyman,' weekly periodical and bulletins issued by the Department of Agriculture and by experiment stations in the several dairy States.

RAYMOND A. PEARSON,
Gen. Mgr. of the Walker-Gordon Laboratory Co.

Dais, dā'is, a platform or raised floor at the upper end of an ancient dining-hall, where the high table stood; also a seat with a high wainscot back, and sometimes with a canopy, for those who sat at the high table. The word is also sometimes applied to the high table itself.

Daisy, the popular English name of a plant of the genus *Bellis* of the natural order *Compositæ*. Properly the name belongs to the English daisy (*B. perennis*). This is a native of Europe and Asia, and is one of the most common of the flowers of England. In the United States the English daisy is generally found in gardens, but it has escaped in some cases, and may be found growing in waste places or on lawns from Nova Scotia through New England and southern New York to eastern Pennsylvania. It has been naturalized in California and British Columbia. One species of the true daisy, the western daisy (*B. integrifolia*), is a rare plant found in moist soil from Kentucky and Tennessee to Arkansas and Texas. The flowers generally called daisies in the United States belong to the chrysanthemum family, although some asters are also given the common name.

Daisy Miller, a novelette by Henry James, published in 1878. From the constant incongruity between the Miller social standards and the Draconian code of behavior of the older European communities, come both the motive and the plot of the story.

Dak, dăk, or **Dawk**, a Hindu word used in India for the mail or post; a relay of men, as for carrying letters, despatches, etc., or travelers in palanquins. The route is divided into stages, and each bearer, or set of bearers, serves only for a single stage. A dak-bungalow is a house at the end of the stage designed for those who journey by palanquin.

Dakar, dä-kär', Senegal, a port furnishing one of the best harbors on the west coast of Africa. It is situated near Cape Verde. There is a railroad between the port and the capital, Saint Louis. Dakar is a fortified military post. Pop. (1902) 12,000.

Dako'ta, or **Dakotah**, a tribe of North American Indians, constituting at one time an important element in the great Sioux group. They were reported numerous in the 17th and 18th centuries, and roamed over extensive hunting grounds in parts of the present States of North Dakota and South Dakota. The tribe consisted of six sub-tribes: (1) Santee; (2) Sisseton; (3) Yankton; (4) Wahpeton; (5) Yanktonnai; (6) Teton. These sub-tribes were divided into bands or groups; as, the Tetons consisted of the Brulé, Blackfeet, and other groups. The Dakotas were fond of war and when not fighting against outsiders would sometimes fight among themselves. In 1658 they had 30 towns on the Mississippi, the Missouri, and Saint Croix. The old war spirit has not died out; in 1862 a portion of the tribe attacked the whites and killed about 1,200. In 1890–1 the whites feared another uprising when the ghost-dance took place at the Pine Ridge agency. The Dakotas are located in the United States, chiefly in North and South Dakota, Nebraska, and Montana. There are about 900 in Canada, and in the United States about 2,800. See INDIAN SCHOOLS; RESERVATIONS; SIOUAN.

Dakota. See NORTH DAKOTA; SOUTH DAKOTA.

Dakota River. See JAMES RIVER.

Dakota Stage, one of the formations of the Upper Cretaceous series in the United States. The rocks, mostly conglomerates and sandstones, cover a vast area extending over the Great Plains from Texas northward into Canada. Their origin is still a matter of speculation, since they are not marine; and in Texas lie unconformably upon the Comanche limestone. West of the Rocky Mountain uplift the Dakota rocks are more fine-grained, and include beds of coal or lignite of workable thickness. In much of the Rocky Mountain region the Dakota rests conformably upon Lower Cretaceous and even Jurassic strata. The exact equivalent of the Dakota stage along the eastern border of the United States is undetermined. The lower cross timber sand of Georgia and Mississippi is probably equivalent to the Dakota. See CRETACEOUS SYSTEM.

Daksha, dăk'shä, in Hindu mythology, a priest to whom Siva gave a ram's head out of revenge, because he did not invite the god to his grand sacrifice.

Dal, däl, a Swedish word signifying, like the German *Thal,* valley, as in Dalecarlia.

Dalaguete, dä-lä-gā'tā, Philippines, a town on the southeast coast of Cebú, 44 miles southwest of the town of Cebú. Trade in the products raised in the interior is carried on with the adjacent islands. In two years the population increased about 2,000. The town would be of more importance as a port of entry, but it has little or no protection from the northeast monsoons and from the south winds. Pop. 21,825.

Dalberg, däl'bĕrg, **Karl Theodor,** Prince and Archbishop of Mayence, chancellor of the empire, and elector: b. 1744; d. Ratisbon 10 Feb. 1817. Having made his academic studies in the universities of Göttingen and Heidelberg, he devoted himself to the study of canon law and entered the ecclesiastical state. In 1772 he was made, by the Elector-Archbishop of Mayence, privy counselor and governor of Erfurt. His administration was directed purely to the welfare of the people and he earned the reputation of being a faithful and capable man of affairs. He continued in the service of the elector, and at the death of his patron he succeeded him as archbishop, elector, and archchancellor of the empire (1802). In 1804 the Pope, Pius VII., being then in Paris for the occasion of the crowning of Napoleon, Archbishop Dalberg was invited by Napoleon to Paris for the purpose of inducing Pope Pius to approve a proposed readjustment of ecclesiastical affairs in Germany. The Archbishop served well the interests of the French emperor, and later had his reward when the readjustment was effected, for, though he had to give up the archiepiscopal see of Mayence and his dignities in the empire, he was more than recompensed by being made metropolitan of Ratisbon, while Aschaffenburg, Wetzlar, and Ratisbon were erected, on his behalf, into a princedom. Further his purely ecclesiastical jurisdiction was enlarged by being made to extend over such parts of the ecclesiastical jurisdiction of Mayence, Cologne, and Treves as lie on the right bank of the Rhine. But of all these dignities and powers, except the archbishopric of Ratisbon, he was deprived after the fall of Napoleon. He was a man of learning, a lover and patron of art, and the intimate friend of Goethe, Schiller, Wieland, and the great contemporary lights of German literature. He was author of several works on philosophy and æsthetics (much consulted by scholars), and he took a lively interest in natural history, mineralogy, chemistry, and agriculture.

Dalber'gia, a genus of fine tropical forest trees and climbing shrubs, natural order *Leguminosæ,* some species of which yield excellent timber. *D. latifolia* (the blackwood, or East Indian rosewood) is a magnificent tree, furnishing one of the most valuable furniture woods. *D. sissoo* gives a hard durable wood, called sissoo, much employed in India for railroad sleepers, house- and ship-building, etc.

D'Albert, däl-bār, **Eugene,** English musician: b. Glasgow, Scotland, 10 April 1864. He is the son of an English composer of French descent. He was at first trained by his father, but subsequently studied with Sir Arthur Sullivan and Dr. Stainer, and after 1882 was a pupil of Liszt. He is very famous as a pianist and has given recitals in the chief cities of Europe and the United States. Besides concertos, string quartettes, songs, etc., he has composed the operas of 'Ruby'; 'Ghismonda'; 'The Departure'; etc.

Dalby, Isaac, English mathematician: b. Gloucestershire 1744; d. Farnham, Surrey, 3 Feb. 1824. He was self-educated, and while teaching arithmetic in London, his acquirements became known. In 1782 he was appointed mathematical master of the naval school at Chelsea, and in 1787 was employed, on the recommendation of the celebrated instrument-maker Ramsden, to assist Gen. Roy in the great trigonometrical survey. In 1799, on the formation of the Royal Military College at High Wycombe, he was appointed professor of mathematics, and continued to hold the appointment till 1820.

Dale, Alan (Alfred J. Cohen), American dramatic critic: b. Birmingham, England, 14 May 1861. After leaving Oxford University he came to the United States and was dramatic critic on the New York *Evening World* 1887–95, and on the New York *Journal* from 1895. He has published: 'Jonathan's Home'; 'A Marriage Below Zero'; 'An Eerie He and She'; 'My Footlight Husband'; 'A Moral Busybody'; etc.

Dale, David, Scottish manufacturer: b. Stewarton, Ayrshire, 6 Jan. 1739; d. Glasgow 17 March 1806. He commenced life as a weaver, and having made the acquaintance of Sir Richard Arkwright a partnership was entered into between them for the erection of cotton-mills on the Clyde, and the settlement of New Lanark was in consequence formed. He had also extensive shares in other spinning factories established under his superintendence in various parts of Scotland, and was head partner in a large manufacturing firm in Glasgow, besides acting there as agent for the Royal Bank of Scotland. In 1799 he retired from business, and disposed of the works at New Lanark to a company of English capitalists, who entrusted the management of them to the celebrated Robert Owen (q.v.), who afterward married Mr. Dale's eldest daughter. He was the founder and pastor of a small religious sect called "Dalites," or "Old Independents."

Dale, Richard, American naval officer: b. Norfolk, Va., 6 Nov. 1756; d. Philadelphia 24 Feb. 1826. While serving as a midshipman on board of the American brig of war, Lexington, he was taken by a British cutter; but, after being confined a twelvemonth in prison, he effected his escape into France, where he joined the celebrated Paul Jones, then commanding the American ship Bon Homme Richard, and was the first man that boarded the English frigate Serapis, which was captured. In 1801 he had the command of an American squadron and hoisted his pennant on board the President.

Dale, Robert William, English Congregational clergyman: b. London 1 Dec. 1829; d. 13 March 1895. He was for many years one of the foremost of non-conformist leaders in England, and in 1877 delivered a series of lectures on preaching at Yale University, being the first Englishman appointed to the Lyman Beecher lectureship. Among his more important writings are: 'The Atonement' (1875); 'Lectures on Preaching' (1877); 'The Epistle to the Ephesians: its Doctrine and Ethics' (1882);

'The Living Christ and the Five Gospels' (1890); 'Fellowship of Christ' (1891). He was a versatile and powerful speaker and exercised an extended influence, both in the United States and England.

Dalhousie, dăl-hoo'zĭ or dăl-how'zĭ, **James Andrew Ramsey**, 10TH EARL AND 1ST MARQUIS OF, British statesman: b. near Edinburgh 22 April 1812; d. 19 Dec. 1860. After filling the offices of vice-president (1843) and president of the board of trade (1844), he was appointed governor-general of India (1847). In the administration of Indian affairs he showed marked ability and great talent, establishing railway lines, telegraphs, irrigation works, etc., and under his rule was annexed the Punjab, Oude, Berar, and other native states, as well as Pegu in Burma, to the British Empire in India. In 1849 he was made a marquis.

Dalhousie, New Brunswick, capital of Restigouche County, and a port of entry. It is situated on Chaleurs Bay and the estuary of Restigouche River. The chief industries are fishing and trading in lumber, salmon, and lobsters. Pop. (1901) 3,000.

Dalhousie College and University, an institution of learning located at Halifax, N. S. It was founded in 1818 by the Rt. Hon. George Ramsay (q.v.), 9th earl of Dalhousie, whose last public act in Nova Scotia was the laying of the corner stone of the old building, 22 May 1820, but it was not until 13 Jan. 1821 that the "bill to incorporate the Governors of Dalhousie College at Halifax" became a law. The purpose of the college as originally stated was "for the education of youth in the higher branches of science and literature," and "to be open to all occupations and sects of religion." The first name of Dalhousie was the "College of Halifax," but in 1821 the legislature granted £1,000 to the new college and named it after its founder. In 1841 university powers were granted to the college. The early history of Dalhousie is a brave struggle for existence. Two attempts were made to unite it with King's College (q.v.), but both proved failures. From 1844 to 1863 Dalhousie ceased to operate as a college, and the governors either allowed the funds to accumulate or managed it as a high school. In 1863, the college was reorganized, with a staff of six professors, a tutor in modern languages, and about 60 students. The governing powers of the institution are (1) the board of governors, the supreme governing body; appointments to it are made by the governor-in-council on the nomination of the board. The governors have the management of the funds and the property of the college; the power of appointing the president, professors, and other officials, and of determining their duties and salaries, and the general oversight of the work of the university. (2) The Senate, consisting of the presidents and professors. To this body are entrusted, by statute, the internal regulations of the university, subject to the approval of the governors. All degrees are conferred by the Senate. (3) The faculties of Arts, Science, Law, and Medicine. These are committees of the Senate for the supervision of the teaching of the university, the preparation of regulations governing the courses of study, and the recommendation of suitable candidates for prizes, scholarship, diplomas, and degrees. In addition to the courses in the liberal arts and in pure science, the university has schools of law, medicine, and engineering. The university is well equipped for its work and is constantly enlarging its sphere of usefulness. It has a large student body and admits students of either sex. Many generous gifts have been made to Dalhousie, notably those of the late George Munro of New York, from 1879 to 1884, which did much to put the institution on a solid financial basis. Alexander McLeod, of Halifax, Sir William Young, and John P. Mott have also made large gifts.

JOHN FORREST,
President of the College.

Dalin, dä'lĭn, **Olof von**, Swedish historian and poet: b. Vinberga, Holland, 29 Aug. 1708; d. Drottingholm 12 Aug. 1763. In 1737 he was appointed royal librarian, and in 1751 became preceptor to the prince royal (afterward Gustavus III.), and in recompense for his zeal and talents was nominated historiographer-royal (1759), and chancellor of the court of Sweden (1763). He exerted much influence by his periodical paper, 'The Swedish Argus' (1733–4), and still more by his spirited poems, particularly 'Satires' (1729), an excellent poem on the liberty of Sweden (1742), many songs, epigrams, and fables. The best edition of his poetical works appeared at Stockholm (1782–3). He acquired equal reputation by his able history of Sweden (1777).

Dall, Caroline Wells Healey, American author: b. Boston, Mass., 22 June 1822. She has been an industrious literary worker, and is the author of many books, among which are: 'Essays and Sketches' (1849); 'Woman's Right to Labor' (1860); 'The College, the Market, and the Court' (1861); 'Egypt's Place in History' (1868); 'Patty Gray's Journey to the Cotton Islands,' and 'What We Really Know About Shakespeare' (1885).

Dall, William Healey, American naturalist: b. Boston, Mass., 21 Aug. 1845. He is the son of Caroline W. H. Dall (q.v.). He is a member of the United States Geological Survey and of many of the scientific societies at home and abroad. Among his published books are: 'Alaska and its Resources' (1870); 'The Currents and Temperatures of Bering Sea and the Adjacent Waters' (1882).

Dallas, Alexander James, American statesman: b. Island of Jamaica 21 June 1759; d. Trenton, N. J., 14 Jan. 1817. He studied law in London and settled in Philadelphia in 1783. He became eminent at the bar, and was United States district attorney in Pennsylvania from 1801 to 1814. He was secretary of the treasury under Madison.

Dallas, George Mifflin, American diplomatist: b. Philadelphia, Pa., 10 July 1792; d. there 31 Dec. 1864. He was the son of A. J. Dallas (q.v.). In 1813 he was admitted to the bar, and soon after entered the diplomatic service. In 1831 he was elected a United States senator from Pennsylvania; was United States minister to Russia 1837–9, and in 1844 was elected Vice-President of the United States. In 1846 his casting-vote as president of the Senate repealed the protective tariff of 1842, though he had

previously been considered a Protectionist. His course on this question aroused much indignation in Pennsylvania. He was United States minister to Great Britain from 1856 to 1861. His principal published writings were posthumous, and include a 'Series of Letters from London' (1869), and a 'Life of A. J. Dallas' (1871).

Dallas, Ga., town, county-seat of Paulding County; on the Southern Railroad; about 30 miles northwest of Atlanta. Pop. 700.

Dallas, Ga., Battle Lines at. After the Confederate evacuation of Dalton (see DALTON, GA., MILITARY OPERATIONS AT), 12 May 1864, and the battle of Resaca, 14–15 May, Gen. Joseph E. Johnston's army retreated by way of Calhoun and Adairsville to Cassville, where Gen. Johnston prepared to make a stand, and Gen. Sherman closed in on him for battle; but Johnston abandoned Cassville during the night of the 19th, and next day crossed to the south side of the Etowah. Sherman occupied Cassville and Kingston, and prepared for another advance. As Johnston held the line of the railroad at Allatoona Pass and other points in advance of Marietta, Sherman concluded to turn those positions by moving from Kingston to Marietta by way of Dallas, a small town about 25 miles south of Kingston and 20 miles west of Marietta, and the converging point of many roads. On the 23d the movement began, but on the same day the Confederate cavalry discovered it, and Johnston divined its intention and prepared to check it by marching to Dallas and covering the roads leading to it.

On the 25th as the advance of Hooker's (Twentieth) corps neared Dallas it was discovered that Hood's Confederate corps held the cross roads at New Hope Church, four miles northeast of Dallas. Hooker concentrated his corps and attacked Hood late in the evening and was repulsed with a loss of 1,346 killed and wounded, and about 60 missing. Hood's loss was less than 400. During the night and early next day the rest of the army moved up on the right and left of Hooker and entrenched, McPherson's two corps, on the right, holding Dallas.

Sherman gradually extended to the left, skirmishing heavily all along the line, and on the evening of the 27th T. J. Wood's division of the Fourth corps attacked the extreme right of the Confederate army near Pickett's Mill and, after a most gallant effort, was repulsed with a loss of 1,224 killed and wounded, and 318 missing. The Confederates reported a loss of 85 killed and 363 wounded. This engagement was a little over two miles northeast of New Hope Church.

There was now heavy skirmishing all along the line, some seven miles in length; and Sherman, still extending to the left, ordered McPherson, who was entrenched at Dallas, to close in on Hooker at New Hope Church, that Hooker might extend to the left; but McPherson deferred the movement until next day (28th), and was getting ready to make it when he was attacked. The Confederates made a desperate effort to seize his works, but were repulsed with a loss of some 300 killed and wounded. McPherson's loss was over 400, of whom 325 were killed and wounded, and 54 missing, in the Fifteenth corps, which bore the brunt of the assault. This was the battle of Dallas.

Sherman continued his movement to the left; McPherson left Dallas 1 June, and closed in on Hooker at New Hope Church; Hooker went to the left; all the wagon roads leading to Allatoona and Ackworth were secured. Allatoona was seized, also the railroad back to the Etowah, and 4 June Sherman was preparing to attack Johnston at New Hope Church, when he found that he had abandoned all his works and fallen back to Kenesaw Mountain; whereupon Sherman moved to the railroad at Ackworth and Big Shanty, and the first stage of the campaign for Atlanta ended. The Union loss in the battles and constant heavy skirmishing near and at Dallas (25–31 May) was about 3,600 killed and wounded. Johnston reports the Confederate loss at 2,005 killed and wounded. The first stage of the campaign (6–31 May) cost the Union army 9,299 killed, wounded, and missing. Johnston reports the Confederate loss for the same period at 5,807 killed and wounded. Consult: 'Official Records,' Vol. XXXVIII.; Van Horne, 'History of the Army of the Cumberland,' Vol. II.; Cox, 'Atlanta'; Johnston, 'Narrative'; Sherman, 'Memoirs,' Vol. II.; the Century Company's 'Battles and Leaders of the Civil War,' Vol. IV. E. A. CARMAN.

Dallas, Ore., city, county-seat of Polk County; situated on La Creole Creek and the Southern Pacific Railroad; about 70 miles southwest of Portland. The industries are dependent upon the productions of the fertile Willamette valley, in which Dallas is situated. Flour-mills, sash and door factories, saw-mills, woolen factories, and tanneries constitute some of the industries. Sandstone quarries in the vicinity furnish excellent stone. Pop. 2,000.

Dallas, Texas, city county-seat of Dallas County; on Trinity River, and on the Missouri, Kansas & Texas, the Texas & New Orleans, the Gulf, Colorado & Santa Fé, the Texas & Pacific, and the Houston & Texas Central R.R.'s; about 200 miles north by west of Austin, the capital of the State. Dallas is in a fertile agricultural region in which the chief products are cotton, wheat, corn, and fruits.

Manufacturing.— It has extensive lumber interests and its manufacturing establishments are increasing. The principal manufacturing industry is saddlery in which Dallas leads all other places in the United States; cotton gin machinery is also extensively manufactured; other prominent manufactories are flour-mills, brewery, various iron and metal works, cotton gins, grain elevators, lumber-mills, woolen-mills, cottonseed-oil mills, and cotton compressers.

Trade and Commerce.— The wholesale trade of the city embraces all lines of goods, and covers a territory comprising all the States and territories of the southwest, and, in some lines, all of the Southern and Western States. It ranks with Kansas City as first in the distribution of farm machinery and implements. The total wholesale trade in 1903 was $50,000,000, the largest retail trade in the Southwest. Dallas has an extensive mail order business; the postal and express receipts are twice as large as that of any other city in the State.

Municipal Service and Improvements.— The city owns and operates water-works, which cost

about $1,500,000. The present supply of water (1903) is secured by impounding storm waters, but it is to be augmented by artesian water. The chief public structures are the county court-house, Federal building, city hall, and Carnegie Public Library. There are fine office buildings, stores, and hotels.

Schools, Colleges, and Libraries.— The public free school system embraces 12 white and five colored schools, at which 8,000 pupils attend, two parish schools and seven suburban schools. Other schools are, Saint Mary's Female College (P. E.), Ursuline Academy, Academy of the Sacred Heart, Saint Mathew's Grammar School, Southwestern University (Med. Dep.), Baylor University (Med. Dep.), Physio-Medical, Dallas Medical, Patton Female Seminary, Landon Conservatory of Music; several business colleges and special and private schools. The Carnegie Public Library cost $50,000.

Churches and Charities.— Dallas is the see of the Roman Catholic and the Protestant Episcopal dioceses, and the official home of a bishop of the Methodist Episcopal Church (South). The number of church edifices are Baptist, 12; Catholic, 7; Christian, 6; Congregational, 4; Episcopal, 6; Evangelical, 3; Methodist, 12; Hebrew, 3; Presbyterian, 10; Christian Science, Seventh Day Adventist, and Unitarian, one each; colored churches of various denominations, 20. The State headquarters of the Salvation Army are located here. The charity institutions are: Buckner's Orphans' Home, Saint Mathew's Home for Aged Women, Women's Home, Parkland Hospital (Pub.), Saint Paul's Sanitarium (R. C.), Cunningham Mission Home, Fowler Orphans' Home, Saint Joseph's Orphanage (R. C.), Dallas Free Kindergarten and Settlement Home, United Charities, and several smaller organizations and institutions.

Finance and Banking.— The city has five National banks (one of which is being organized, November 1903), with capital and surplus amounting to $2,418,000; deposits, $10,827,324; one private bank; one trust company, capital $500,000; and 13 savings and loan companies. The National banks are designated as reserve depositories.

Parks and Cemeteries.— The parks are well laid out and most attractive. They are the City Park, Oak Lawn, Exall's, Oak Cliff, Spann's, and Zang's. The cemeteries are Greenwood, Oaklawn, Evergreen, Oak Cliff, the Hebrew, the Catholic, the Orthodox Jews', Odd Fellows', Masons', and two for the colored people.

Government.— The government is vested in a mayor and 12 aldermen, chosen biennially by the people, and a police commissioner and a fire commissioner, appointed biennially by the governor of Texas.

Growth and Population.— Since 1900, the last Federal Census, the area of the city has been extended from seven and one half to nine square miles. Pop. (1890) 38,067; (1900) 42,638; including recent addition, the population in 1900 was 46,208. Pop. 1903, est 65,000. (The Dallas city directory estimates the population as 75,415.)

THOMAS FINTY, JR.,
'*Dallas Morning News.*'

Dalles, The, or **Dalles City,** Ore., county seat of Wasco County, on the Oregon Railroad. It is about 30 miles northeast of Mount Hood, and on that portion of the Columbia River (on the Washington State boundary line) where the scenery is noted for grandeur. It is situated in a sheep and cattle-raising country, hence its trade is largely in cattle and wool. Fruits grow here in the Columbia Valley. Its chief industries are flour and grist milling, and wool scouring. A military post at Fort Dalles was established in 1838, and about the same time a mission was opened by the Methodist Church. The railroad station is known by the name of Dalles, and the local name often used is Dalles City; but the name of the post-office is The Dalles. Pop. (1900) 3,542.

Dallin, Cyrus Edwin, American sculptor: b. Springville, Utah, 22 Nov. 1861. He studied at the Ecole des Beaux Arts, and the Julian Academy, Paris, and has since practised his art in Boston, where he is instructor in sculpture in the Massachusetts State Normal Art School. He is a member of various art societies and among medals received by him are the gold medal of the American Arts Association in 1888, and the first-class medal of the World's Columbian Exposition at Chicago, 1893. Among his most important works are the 'Pioneer Monument,' and the 'Angel' for the Temple, both at Salt Lake City; 'Sir Isaac Newton' in the Congressional Library; the 'Medicine Man,' Fairmount Park, Philadelphia; 'The Signal of Peace,' Lincoln Park, Chicago.

Dallinger, Frederick William, American lawyer: b. Cambridge, Mass., 2 Oct. 1871. He was graduated from Harvard 1893, and the Harvard Law School in 1897, and was admitted to the Suffolk bar in 1897. He was a member of the lower House of the State legislature in 1894, and of the State Senate 1896–9. He has published: 'Voters' Pocket Manual' (with Pryor) (1892); 'Manual of Civil Government for Use in Public Schools' (1893); 'Nominations for Elective Office in the United States' (1896).

Dallinger, William Henry, English scientist and clergyman: b. Devonport, England, 5 July 1842. He entered the Wesleyan ministry in 1861 and after being minister at Liverpool 12 years was governor of Wesley College, Sheffield, 1880–8. His microscopical researches began in 1870. He became Fellow of the Royal Society in 1880, has been Rede lecturer to the University of Cambridge, lecturer at Oxford and at the Royal Institution, and was president of the Royal Microscopical Society 1883–7. He has published 'Minute Forms of Life' (1880); 'The Origin of Life' (1878); 'The Creator and What we may Know of the Method of Creation' (1887); revision of Carpenter's 'The Microscope and its Revelations' (1891).

Dalma'tia, a province of Austria, and the most southern crownland of the Austrian dominions. It consists of a long, narrow, triangular tract of mountainous country, and a number of large islands, along the northeast coast of the Adriatic Sea. In breadth it is very limited, not exceeding 40 miles in any part. The surface is much varied: a ridge of limestone mountains separates the north portion from

Bosnia, and another runs nearly parallel with the coast, sterile, and destitute of soil. The highest peak is Orien, 6,225 feet. The waters of many of the Dalmatian streams have a petrifying quality, and cover the rocks over which they flow with a coarse stalagmitic deposit. The country is not rich in metals, although in ancient times it is said to have produced gold. In mineral wealth Dalmatia is the poorest of the Austrian provinces, but some brown coal and asphalt are obtained, also manganese ore and salt. Most of the islands are mountainous, and present the same general aspect as continental Dalmatia, but are valuable for their productions, such as timber, wine, oil, cheese, honey, salt, and asphalt; and in several of them ship-building is carried on to a considerable extent. In summer the prevalent wind on the coast is the mistral, or northwest wind, which moderates the excessive heat of the season. The climate of Dalmatia, generally, is warmer than in any other part of the Austrian dominions.

Agriculture is in an extremely backward state, but it is said to have shown considerable improvement of late. The principal agricultural productions are maize, rye, barley, figs, olives, and vines; but sufficient grain is not produced to supply the wants of the country. Dalmatia has hardly any manufactures worthy of the name. A kind of coarse cloth used by the peasants is made. The production of silk has been introduced, and the soil is well suited to the growth of the mulberry-tree. There is a considerable manufacture of liqueurs at Zara, the principal of which is the far-famed maraschino.

The Dalmatians of the coast, and the principal families in the large towns of the interior, are mostly of Venetian extraction; and those who are of Hungarian origin have adopted the customs and language of the Italians. The latter is spoken in all the seaports; but the language of the country is a dialect of the Slavonic, which alone is used by the peasants in the interior. The Dalmatians are a tall, muscular, and vigorous race, generally hospitable, but lazy, vindictive, and dissipated.

The majority of the inhabitants are Roman Catholics, but there are also a considerable number of Greek Catholics. Education is generally diffused by the system of national schools, but it is of a very elementary character. Principal towns — Zara the capital, Spalatro, and Ragusa. Dalmatia was conquered by the Romans in the time of Augustus. In the 7th century it was taken by the Slavs, who founded there a kingdom that lasted till 1050, when the greater part of it was united to Hungary, and the remainder passed under the protection of Venice. In 1797 the Venetian portion, along with the city of Venice, was ceded to Austria; but in 1805, by the treaty of Pressburg, it fell into the hands of Napoleon, who first united it to the kingdom of Italy, and subsequently in 1810, to the kingdom of Illyria. The events of 1814 brought Dalmatia again under Austrian rule. A partial insurrection broke out against the government in October 1869, but was suppressed in the February of the following year. Dalmatia has a diet of its own of 43 members; and it sends 11 deputies to the Austrian House of Representatives. Pop. 593,784.

Dalmatian Dog. See COACH-DOG.

Dalmat'ic (*Dalmatica*), an ecclesiastical vestment, open at each side below the insertion of the sleeves, which are wide. It is the principal vestment worn by the deacon in the Roman Catholic Church when ministering at the Mass, or in processions and in other functions. It is also worn under the chasuble, by bishops, when they celebrate the Mass pontifically; and it is a part of the vesture of a king both in England and in continental European countries. It is commonly of silk; its color varies according to directions of the ritual. The dalmatic was originally a long under-garment of white Dalmatian wool, but little different from the Roman tunic, and not till the fourth century was it a distinctively ecclesiastical garment. At first it was worn only by the Roman deacons, but later its use extended throughout the whole Church. So, too, the use of the dalmatic as part of the solemn attire of bishops was at first restricted to the Pope, but afterward was conceded to all bishops. In the Greek Church a vestment answering to the dalmatic, called stoicharion, is worn by deacons in solemn functions, and in the same Church the celebrating priest wears the stoicharion under the chasuble; but in this case the garment is always white. The two stripes, usually on the dalmatic, were originally purple, that is, a shade near scarlet, and were probably a survival of the *latus clavus* of the tunic of senators.

Dalny, dăl'y-nĭ, Russia, city and free port 20 miles north of Port Arthur; at the east terminus of the Siberian Railway; connected with Saint Petersburg by the Central Manchurian Railway. It was established expressly for a commercial seaport by an edict of the czar of Russia, dated 30 July 1899. It was thrown open to the commerce of all nations 1 Dec. 1901. Dalny is situated on the Liao-tung Peninsula, which extends south into the Gulf of Pechili, China.

The harbor, in which vessels drawing 30 feet can enter at low water, is one of the finest and deepest on the Pacific. The surface of the bay is sufficient for all the shipping of China. Great piers are being built of blocks of stone and cement which weigh from 20 to 50 tons each. Seven railroad tracks and nine large warehouses are being constructed on the piers. A large break-water is being made across the pier harbors, which will allow ships to lie at the piers, and regardless of weather to load or unload.

The port will have no custom-house, but will be absolutely free, not even the small rates of Chinese customs being charged on goods being imported or exported. For the encouragement and development of commerce only the lowest possible rates will be required for tonnage, and the use of docks, wharves, and warehouses. The policy of low charges, the easy access to the harbor during all seasons of the year, the small labor needed to transfer goods from the ocean steamers to the cars, and the cheap coolie service will combine to make this the most economical shipping port in the Occident. The rules governing the city were approved by the emperor of Russia 10 Aug. 1899. The Chinese Railway Company is to build the city under the direction of the Russian minister of finance. Pop. (1903) 41,260. See MANCHURIA.

Dalrymple, dăl-rĭm'pl, **Alexander,** Scottish hydrographer: b. Hailes, near Edinburgh, 24 July 1737; d. London 19 June 1808. In 1752 he went to India in the service of the East India Company, and while there made hydrography his

particular study. In 1705 he obtained the appointment of hydrographer to the Admiralty, as well as to the East India Company. His most important publications are: 'Discoveries in the South Pacific Ocean'; 'A Collection of South Sea Voyages'; 'A Relation of Expeditions from Fort Marlborough to the Islands of the West Coast of Sumatra'; 'A Collection of Voyages in the South Atlantic Ocean'; 'A Memoir of a Map of the Land Round the North Pole'; 'Journal of the Expeditions to the North of California'; 'The Oriental Repertory.' He was also the author of many historical and political tracts.

Dalrymple, Sir David, Lord Hailes, Scottish lawyer and antiquary: b. Edinburgh 27 Oct. 1726; d. 29 Nov. 1792. In 1766 he was made lord of session with the title of Lord Hailes, and later a lord of judiciary. He published 'Annals of Scotland' (1780), and other works on Scottish history, both ecclesiastical and political, antiquities, etc.

Dalrymple, James, 1st Viscount Stair, Scottish lawyer and statesman, b. Carrick, Ayrshire, May, 1619; d. Edinburgh 25 Nov. 1695. In the civil war he sided with Parliament, but soon relinquished that party, and became professor of philosophy at Glasgow. He then adopted law as a profession, and in 1670 was made president of the Court of Sessions. He was adverse to the severe measures adopted against the Covenanters, and having excited the enmity of the Duke of York, lost his appointments, and retired to Holland in 1682. Here he became a favorite with the Prince of Orange, who, after the revolution, created him Viscount Stair. Stair wrote: 'The Institutes of the Laws of Scotland' (still a standard authority); 'Philosophia nova experimentalis'; 'Vindication of the Divine Perfections'; 'An Apology for his Own Conduct'; etc.

Dalrymple, John, 1st Earl of Stair, Scottish statesman: b. 1648; d. 8 Jan. 1707. He was son of James Dalrymple (q.v.). He was called to the Scottish bar in 1672, and his eloquence and ability soon gained him a leading place in his profession, as later in the Scottish Parliament. Under Charles II. he suffered imprisonment twice for not sufficiently enforcing the persecuting acts, but held office in Scotland under James. He was largely instrumental in carrying out the 1688 revolution in Scotland, and for some time acted as the king's representative in that country, but his undoubted services have been somewhat discounted by his connection with the massacre of Glencoe in 1692. He assisted largely in bringing about the union between England and Scotland. He succeeded his father as viscount in 1695, and in 1703 was created earl.

Dalrymple, John, 2d Earl of Stair, Scottish general; b. Edinburgh 20 July 1673; d. there 9 May 1747. He entered the Cameronian Regiment in 1692, and in 1701 was appointed lieutenant-colonel of the Scots regiment of foot guards. In 1707 he succeeded to the earldom and became one of the Scottish representative peers, but still continued his military life, and distinguished himself in the campaigns of Marlborough, and more particularly at the battles of Oudenarde, Malplaquet, and Ramillies. On the accession of George I. he was appointed a privy councilor, and went on a diplomatic mission to France, where he attracted much notice by the splendor of his retinue, and also displayed great skill and address. He returned in 1720, and for the next 20 years he took an active interest in agricultural pursuits. In 1742, on the dissolution of Walpole's administration, he again entered public life, and continued to act in different capacities, civil and military, till his death.

Dalsgaard, Christen, kris'tĕn dāls'gārd, Danish artist: b. Krabbesholm, Jutland, 30 Oct. 1824. He studied at the Copenhagen Academy. Among his paintings, which deal mostly with Danish peasant life, are: 'Christmas Morning'; 'Jutland Peasants going to Communion'; 'Fisherman and Daughter'; 'Seizure for Debt'; 'One of the Wise Virgins'; 'Ansgar and Odbert Baptizing Mother and Child.'

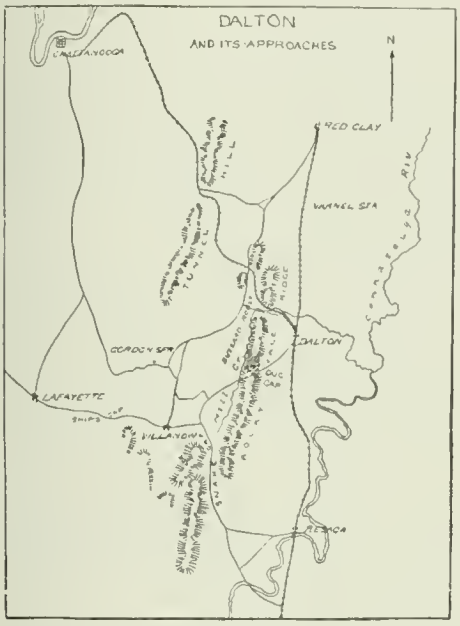
Dalton, John, English chemist and physicist: b. Eaglesfield, near Cockermouth, Cumberland, 6 Sept. 1766; d. Manchester 27 July 1844. He was mainly self-educated, and showed such a decided turn for mathematics that he obtained the position of professor of mathematics and natural philosophy in New College, Mosley Street, Manchester, in 1793. The same year he published his early meteorological observations and essays. In 1799, on the removal of New College to York, he resigned his chair, but continued to give private lessons in the same branches. In 1808 he commenced the publication of his 'New System of Chemical Philosophy,' which, containing his brilliant discovery of the atomic theory, produced an important revolution in the science, gave him a very high place among philosophical chemists, and spread his fame over Europe. The Royal Society of London in 1826 admitted him a member, and unanimously awarded to him the first of two gold medals intended for those who had made the greatest discoveries in science. He was also elected member of the Institute of France, of the Royal Academies of Science of Berlin and Munich, and of the Natural History Society of Moscow. See 'Life,' by Lonsdale (1874); Roscoe and Harden, 'New View of the Origin of Dalton's Atomic Theory' (1896.)

Dalton, John Call, American physiologist: b. Chelmsford, Mass., 2 Feb. 1825; d. New York 11 Feb. 1889. He was graduated at Harvard in 1844 and at Harvard Medical School in 1847. He was successively professor of physiology at the University of Buffalo, at the Vermont Medical School, at the Long Island College Hospital, and at the New York College of Physicians and Surgeons. He served as an army surgeon throughout the Civil War. His published works include: 'Human Physiology' (1859); 'Physiology and Hygiene for Schools, Families and Colleges' (1868); 'The Experimental Method of Medicine' (1882); 'Topographical Anatomy of the Brain' (1885).

Dalton, Ga., city and county-seat of Whitfield County; on the Southern and the Nashville, Chattanooga & Saint Louis railroads; 100 miles northwest of Atlanta. It is a health resort, and the seat of Dalton Female College. It has canning factories, cotton compresses, flour-mills, foundries and machine shops, public schools, weekly newspapers, and a national bank. Pop. 4,315.

Dalton, Ga., Military Operations at (23–25 Feb. 1864, and 8–12 May 1864, including engagements at Buzzard's Roost Gap, Dug Gap,

Rocky Face Ridge, and Varnell Station). Dalton is in the northwestern part of Georgia, where the Chattanooga and Atlanta R.R. is intersected by that from Cleveland, Tenn. By rail it is 38 miles southeast of Chattanooga. When Gen. Bragg was supposed definitely to have abandoned Chattanooga, 9 Sept. 1863, Gen. Halleck ordered Gen. Rosecrans to occupy Dalton, and there Bragg retreated after his defeat at Lookout Mountain and Missionary Ridge, 24–25 Nov. 1863. In February 1864 Gen. Grant ordered Gen. Thomas to seize the town. Thomas moved, reported that he could not carry the position, and the effort was abandoned. His movement cost the Union army about 300 killed and wounded, and the Confederates about 200.



Dalton, the first objective point of Sherman's Atlanta campaign, was held 30 April 1864, by Gen. J. E. Johnston, with 54,400 men. The approaches to the place were difficult, and it was practically impregnable. Early in May Sherman concentrated his grand army in and around Chattanooga for his Atlanta campaign. It was made up of the armies of the Cumberland, Tennessee, and Ohio, commanded respectively by Gens. Geo. H. Thomas, J. B. McPherson, and J. M. Schofield, aggregating 98,797 men and 254 guns. The Army of the Cumberland had about 60,000 men, the Army of the Tennessee 25,000, and the Army of the Ohio, 14,000. On 6 May the Army of the Cumberland was at and near Ringgold, the army of the Tennessee at Gordon's Mill, on the Chickamauga, and the Army of the Ohio near Red Clay, on the Georgia line, north of Dalton. The four corps of Thomas and Schofield were ordered to move on Dalton in front, while McPherson with two corps moved through Snake Creek Gap. On the 7th McPherson was ordered to march from Gordon's Mills through the Gap to Resaca, 18 miles south of Dalton. He marched by way of Ship's Gap and Villanow, pushed through Snake Creek Gap, a wild defile, nearly six miles long, 15 miles south of Buzzard's Roost, and on the morning of the 9th drove back Grigsby's Kentucky cavalry brigade, and marched to within a mile of Resaca, then held by two brigades under Gen. Cantey. Finding the place too strong to be assaulted, McPherson fell back to a strong position at the east end of the Gap. Meanwhile Thomas and Schofield had pressed forward. Thomas drove the Confederates in his front full through Buzzard's Roost Gap, and Schofield closed down on Thomas' left. On the 8th there was heavy skirmishing between Thomas and the Confederate divisions of Stewart and Bate at Buzzard's Roost, and about six miles farther south a determined assault.

The road from Lafayette to Dalton passes through a cleft in the palisade, which had been deepened and widened, hence known as Dug Gap. Geary's division attacked this gap. Skirmishers were thrown out who drove those of the enemy from the foot of the ridge and up the road nearly to the summit, when two brigades were formed in double lines on either side of the road. The Confederates were driven clear to the summit. The position of the Gap could not be carried, and an assault on the perpendicular palisade south of it was ordered, where it was broken by a few clefts through which four or five men could move abreast. The men charged, a few reached the summit, to be killed or captured, and the assault failed. After a short breathing-spell another effort was repulsed with much loss. Still another attempt was made by a single regiment, but it also failed. Everywhere the assault was repulsed, and the Federals withdrew after a loss of 306 killed and wounded, and 51 captured or missing. It is doubtful if the Confederate loss exceeded 30 men. At Varnell's Station Stoneman's and Wheeler's cavalry divisions had an engagement in which the loss was about 150 on each side, and Thomas pressed so vigorously in front of Buzzard's Roost that the heavy skirmishing attained the dimensions of a battle. By the 11th Sherman moved his army to pass through Snake Creek Gap. On the evening of the 12th Johnston was fully informed of the movement toward his rear, which had been covered by the ridge and the forests of the country, and he abandoned his position that night to give Sherman battle at Resaca. On the morning of the 13th Howard occupied Dalton. The Union loss around Dalton, 7–12 May, was about 830 killed and wounded; the Confederate loss not more than half that number. Consult: 'Official Records,' Vol. XXXVIII.; Van Horne, 'History of the Army of the Cumberland,' Vol. II.; Johnston, 'Narrative,' Sherman, 'Memoirs,' Vol. II.; Cox, 'Atlanta'; the Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. Carman.

Dalton-in-Furness, England, town in Lancashire, and 30 miles northwest of Lancaster by the Furness Railway. In its vicinity are extensive iron works, rich hematite iron-ore mines, and the ruins of the magnificent abbey of Furness. Dalton Castle, an old tower in the town, was formerly associated with Furness Abbey. The painter Romney was born and buried here. It is connected with the Irish Sea by a canal three miles long. Pop. (1901) 13,020.

Daltonism. See Color Blindness.

Dalton's Law. See PNEUMATICS.

D'Alviella, dal-vē-ĕl-la, COUNT **Goblet,** gob-lā, Belgian savant: b. Brussels 10 Aug. 1846. He was educated at Brussels and Paris and in 1879 married a Miss Packard of Albany, N. Y. He is a member of the Royal Academy of Belgium and of the Royal Asiatic Society of Great Britain. He was for some time director of the 'Revue de Belgique,' was Hibbert lecturer at Oxford University in 1891, and has published 'Sahara and Lapland' (1874); 'Inde et Himalaya' (1877); 'Contemporary Evolution of Religious Thought in England, America and India' (1885); Hibbert Lectures on 'Origin and Growth of the Conception of God' (1892); 'The Migration of Symbols' (1894); 'Ce que l'Inde doit à la Grèce' (1897); and other works in French.

Daly, Charles Patrick, American jurist and author: b. New York, 31 Oct. 1816; d. 19 Sept. 1899. He had a distinguished judicial career in his native city, becoming justice of the court of common pleas in 1844, first judge of the court in 1857, and chief justice in 1871, retiring on account of age in 1886. He was president of the American Geographical Society for many years prior to his death. His works include: 'First Settlement of Jews in North America'; 'What We Know of Maps and Map Drawing Before Mercator,' and similar investigations.

Daly, John Augustin, American dramatist and theatrical proprietor: b. Plymouth, N. C., 20 July 1838; d. Paris 7 June 1899. In 1869 he opened his Fifth Avenue Theatre in 24th Street, New York; and after its destruction by fire in 1873 he opened its successor in 28th Street. In 1879 he opened Daly's Theatre in Broadway. Among his original plays are 'Divorce'; 'Pique'; 'Horizon'; 'Under the Gaslight.' He also wrote: 'Peg Woffington, a Tribute to the Actress and the Woman.'

Daly, Joseph Francis, American lawyer: b. Plymouth, N. C., 3 Dec. 1840. He was educated in New York, studied law and was admitted to the bar there in 1862. He was judge of the court of common pleas, 1870–96, and chief justice of the same 1890–6. He was also justice of the Supreme Court 1896–8. He was one of the founders of the Players' Club in New York and was president of the Catholic Club 1894–9.

Dalyell, or Dalzell, Thomas, Scottish soldier: b. about 1599; d. 23 Aug. 1685. He was taken prisoner fighting on the royalist side at Worcester, and afterward escaped to Russia, where he was made a general. Returning to England at the Restoration, he was made commander-in-chief of the forces in Scotland, and made himself notorious for his ferocity against the Covenanters.

Dalzell, John, American lawyer: b. New York 19 April 1845. He removed with his parents to Pittsburg in 1847, was educated at Yale and after studying law was admitted to the bar in 1867. He has practised his profession in Pittsburg and has been an attorney for the Pennsylvania Railroad Company for its western lines for many years. He has been a Republican member of Congress from 1887 and served on the Ways and Means Committee in the Fifty-fourth and succeeding Congresses.

Dalziel, Edward, English painter and illustrator: b. Wooler, England, 5 Dec. 1817; d. 25 March 1905. He became associated with his brother George in painting, drawing, and wood engraving, the firm of the Brothers Dalziel having been for half a century well known in relation to illustration of a high character. He has exhibited at the Royal Academy and Royal Institute of Painters in Oil, and with his brother wrote: 'The Brothers Dalziel: a Record of Fifty Years, 1840–1890.'

Dalziel, George, English wood engraver: b. Northumberland 1816; d. Hampstead 7 Aug. 1902. He was a brother of Edward Dalziel (q.v.) He established himself in London where he was joined by his two brothers, and the firm soon became famous for the excellence of its illustrated works, the best artists in England being engaged to draw blocks for their use.

Dama, dā'ma, a genus of the deer family (*Cervidæ*), comprising the common fallow deer (*Dama vulgaris*) and the Persian fallow deer (*D. mesopotamica*). The name is also given to a species of large gazelle (*Gazella dama*) found in the Sudan. It is allied to the mohr (q.v.), but with relatively shorter lyrate horns and no dark stripe on the flanks. Closely allied to it also is the aoul (q.v.) of Somaliland.

Dam'ages, the indemnity recoverable by a person who has sustained an injury, either in his person, property, or relative rights, through the act or default of another; also, the sum claimed as such indemnity by a plaintiff in his complaint. Compensatory damages are damages allowed as a recompense for the injury actually received. Consequential damages are those which though directly, are not immediately consequential upon the act or default complained of. Exemplary, vindictive or punitive damages are, in legal contemplation, synonymous terms. Exemplary damages would seem to mean such damages as would be a good round compensation, and an adequate remedy for the injury sustained, and such as might serve for a wholesome example to others in like cases.

Where injuries are maliciously, wantonly, or recklessly inflicted, the right of the jury to award punitive damages is said to be as old as the right of trial by jury itself, and is not, as some seem to suppose, an innovation upon the rules of the common law. In England as early as 1703, it was declared that the jury had done right in giving punitive damages. (Hackle *v.* Money, 2 Wils. 205). And now, both in England and in the United States, the doctrine of punitive damages seems to be well settled, and the right of the jury to give such damages in a proper case cannot be shaken in any of the States by anything short of legislative enactments.

General damages are those which necessarily and by implication of law result from the default or act complained of. Special damages are such as arise directly, but not necessarily, from the wrongful act or default complained of. Parties entering into an agreement may estimate beforehand the amount of damages to result from a breach of the agreement, and may prescribe in the agreement itself the sum to be paid by either of the parties to the other by way of damages for such breach. Such damages are called liquidated damages, when sanctioned by the law. If, however, the agreement is such that the law

refuses to adopt it, then the damages agreed upon will be regarded as a penalty, or as in the nature of a penalty. General damages need not be alleged in the complaint of the person injured, nor is it necessary that any specific proof of damages be given to entitle the party injured to recover. The legal presumption of injury in cases where it arises is sufficient to maintain the action. Whether special damage be the gist of the action, or only collateral to it, it must be particularly stated in the complaint, as the plaintiff will not be permitted otherwise to go into evidence of it at the trial, because the defendant cannot also be prepared to answer it.

To constitute a right to recover damages, the party claiming damages must have sustained a loss; the party against whom they are claimed must be chargeable with a wrong; the loss must be the natural and proximate cause of the wrong. Where there is no loss there is no right to damages, properly so called. A sum in which the wrong-doer is mulcted simply as a punishment for his wrong, and irrespective of any loss caused thereby, is a "fine" or a "penalty," rather than damages. Damages are based on the idea of a loss to be compensated, a damage to be made good. It is not necessary, however, that this loss should always be distinct and definite, capable of exact description, or of measurement in money. A sufficient loss may appear, from the case itself, to sustain an action. A sufficient loss to sustain an action may appear from the mere nature of the case itself. The law in many cases presumes a loss where a wilful wrong is proved; and thus damages are also awarded for injured feelings, bodily pain, grief of mind, injury to reputation, and for other sufferings which cannot be made the subjects of exact proof and computation in respect to the amount of loss sustained.

Daman, dä-män', or **Damão**, India, a seaport town in Hindustan, at the mouth of the Gulf of Cambay, on the Damanganga or river of Daman, 100 miles north from Bombay. It belongs to the Portuguese, who sacked it in 1531, retook it in 1558, and have kept possession of it ever since. It carries on some cotton-weaving, fishing, ship-building and several salt works. Pop. about 6,000. The Portuguese district here of the same name possesses valuable teak forests. It has an area of 148 square miles. Pop. about 64,000.

Daman, dä'man, the Syrian name for the coney of Scripture. See CONEY; HYRAX.

Damanhur, dä-män-hoor', Egypt, town of Lower Egypt, capital of the province of Beharah, an important railway centre and seat of cotton manufacture. Pop. (1897) 27,236.

Damaraland, dä-mä'rä-länd, a district of German Southwest Africa, bounded on the west by the Atlantic Ocean. It is mountainous, some of the peaks ranging in height from low hills to elevations of over 8,000 feet. In some parts there are broad prairies, which could afford pasturage for thousands of cattle. In the mountains have been found rich deposits of copper. The produce of the interior consists of ivory, feathers, skins, etc. The Damaras, properly Herero, a Bantu stem, number about 80,000, of whom 50,000 live in the mountain district; they are nomads, and own large flocks and herds. The Hawkoin, or Hill Damaras, in the northeast, however, who are a much lower type, now speak Hottentot. The only harbor in this part of the coast is Walfisch Bay, which properly belongs to Nama Land; it was annexed to Cape Colony in 1884. In the same year the desert region along the coast was made a German protectorate.

Damascene, St. John (JOANNES DAMASCENUS, JOHN OF DAMASCUS), a monk and an illustrious theologian of the Greek Church in the 8th century, native of Damascus, b. about 700; d. about 755. He was the first to reduce to system the Church's dogmas and to classify the decrees of the General Councils concerning matters of faith; this he does in the third part of his work: 'The Fountain of Knowledge.' In the first part: 'Points of Philosophy,' he makes application to theology of the principles of Aristotle's *Dialectica;* the second part consists of a reproduction of Epiphanius' work: 'On Heresies,' with additional notices of heresies condemned by the Church after Epiphanius' time; the third and most valuable part is the 'Precise Exposition of the Orthodox Belief.' In mediæval times the 'Precise Exposition,' translated into Latin in the 12th century, gave direction to the theological views and speculations of the schoolmen; and hence Damascenus has been denominated the "Father of Scholasticism." Many other treatises are extant which bear his name as author, but of most of these the authenticity is doubtful. No contemporary account of his life has come down to us; the earliest biographical notice of him that we have dates from the 10th century, and that is unworthy of credit. The epithet: "Chrysorrhoas," that is, gold-streaming, bestowed upon him in his lifetime, testifies to his reputation for eloquence. He is recognized as a saint both in the Greek and the Latin Church.

Damascius, dą-măsh'ĭ-ŭs, a philosopher, so called from his supposed native place Damascus, lived in the beginning of the 6th century. He is known as one of the most distinguished teachers of the Neoplatonic philosophy. In Alexandria he studied rhetoric under Theon and mathematics under Ammonius; and afterward in Athens his teachers were Zenodotus and Marinus, the successors of the more celebrated Proclus. Numerous fragments of his writings remain, one of which is entitled: 'Doubts and Solutions respecting the First Principles.' It is so mystical as to be almost unintelligible, but it is important to the history of philosophy from its frequent notices of earlier philosophers.

Damas'cus (native name DIMISHK-ES-SHĀM, Syria), a celebrated city, capital of the Turkish vilayet of Syria, finely situated on a plain, at the eastern base of the Anti-Libanus range, supposed to be the most ancient city in the world. It is six miles in circumference, and is surrounded by a dilapidated wall. The plain on which the city stands is of great extent, and is covered with the most beautiful gardens and orchards, irrigated by the waters of the Barrada, forming a grove of more than 50 miles in circuit, rich in fruits, including oranges, lemons, citrons, pomegranates, mulberries, figs, plums, walnuts, pears, and apples. The interior of Damascus by no means corresponds with the beauty of its environs. The streets are narrow and crooked, paved with basalt, and have a gloomy and dilapidated appearance; they are generally in three divisions —

that in the middle devoted to cattle and riders being the lowest, and of the same width as the other two. In most parts of the city the fronts of the houses are built with mud, and pierced by a very few small grated windows, with red painted shutters. They are low, with flat-arched doors, resembling those of stables, while a dunghill and pool of putrid water almost invariably stand before each door. In many of them, however, a singular contrast is presented between the dull, prison-like outer walls of gray mud and the richness within. Interiorly they are of a quadrangular form, enclosing a court paved with marble, ornamented with beautiful trees and flowering bushes, and having copious fountains playing in the centre. The lower rooms on each side of the court are raised above its area, and open in front — their roofs and walls highly ornamented with figures of flowers and inscriptions, and a variety of arabesque devices. The furniture, also, is of the most splendid description. The best and wealthiest part of the city is the Moslem quarter, where the streets are wider and cleaner, the houses higher and better built, and the supply of water much more abundant than in any other part of the town. The Christian and Jewish quarters are the most miserable.

Among the places most worthy of notice in Damascus are the bazaars. They are merely long streets — the principal one about one and a half miles in length — covered in with high wood-work, and lined with shops, stalls, stores, and cafés. The shops are narrow, and go only a short way back. There is a separate bazaar for almost every commodity exposed to sale, and all of them are patrolled by multitudes of confectioners and dealers in ices and cooled sherbets. In the midst of the bazaars stands the Great Khan, said to be one of the most magnificent structures of its kind. It is an immense cupola, supported on granite pillars, and built, in part, of alternate layers of black and white marble. Its gate is one of the finest specimens of Moorish architecture to be seen in the world. In this building, and in 30 inferior khans, purchases and sales are daily conducted by the merchants, who have their counting-houses near them. The principal mosque, a fine edifice, was destroyed by fire 14 Oct. 1893. There are three Latin monasteries in Damascus — those of the Franciscans, Capuchins, and Lazarists. The principal Roman Catholic churches form part of the monastic buildings; there are, besides, a number of detached churches belonging to different sects in various parts of the city. Besides the more remarkable architectural objects mentioned, there are an extensive citadel, and a serai or palace, in which the pasha resides. The most interesting locality in the city is, perhaps, what is called "Straight Street," mentioned in connection with the conversion of the apostle Paul. It is the most important, largest and busiest street in Damascus; is about one mile in length, and runs from east to west. The house of Judas, also, to which Ananias went, is still pointed out, as well as that of Ananias.

Damascus was formerly a great emporium of trade between Europe and the East, and still imports English cottons and other goods to the yearly value of about $2,500,000. It is also a place of considerable manufacturing industry. There are a number of manufactories of silk, damasks, cotton, and other fabrics; numerous cotton-printing and dyeing establishments, tobacco factories, copper and iron foundries, and glass works. The manufacture of Damascus blades, for which the city was once so celebrated, no longer exists. Saddles and bridles, rich and highly finished, fine cabinet work, and elegant jewelry, are among the manufactures of Damascus. It is one of the holy cities, and here the pilgrims assemble on their journey to, and separate on their return from Mecca. Until a very recent period no Christian could walk the streets without incurring the risk of being insulted, and probably maltreated, by its fanatical population; and no farther back than the year 1860 a considerable number of Christians were massacred by the bigoted Moslems. This intense hatred of the Frank, however, is now considerably abated.

Damascus to-day is perhaps the most thoroughly Oriental in all its features and characteristics of any city in existence. Of its origin nothing certain is known. There is, however, abundant evidence of its great antiquity, as it is mentioned in Gen. xiv. 15, as existing 1913 B.C., and appears even then to have been a place of note. At subsequent periods it fell successively under the power of the Israelites under David, the Persians, Greeks, and Romans, attaining great eminence under the last. In 1516 it fell into the hands of the Turks. A Protestant mission and schools have long been in operation here. Beirout is the seaport of Damascus, and is reached by a road 70 miles long. A railroad has been constructed from Beirout, and one from Damascus to the Hauran. Gas and street cars have recently been introduced. Pop. (estimated for 1898) 225,000, of whom perhaps 25,000 are Christians.

Damascus Blades, swords or scimitars formerly made chiefly at Damascus. These famous weapons, though in use among nations little skilled in the metallurgic arts, long before the Christian era, and made familiar to the European nations from the time of the crusades, long defied all attempts at imitation. It appears that the Indian wootz was in ancient times carried from the region of Golconda in Hindustan (where, as well as in Persia, it still continues to be manufactured by the original rude process), and at Damascus was converted into weapons. These were particularly distinguished for their keen edge, capable of severing heavy iron spears or cutting the most delicate gossamer fabric floating in the air; and for the peculiar watered appearance of the steel, which was covered with delicate black, white, and silvery veins, parallel to each other or interlaced. The Damascus appearance may be given to iron by welding together bars of different degrees of hardness, drawing them down, and repeating the process several times. (See Damascus Iron.) Karsten suggests that by the use of bars of good steel the best Oriental blades may have been fashioned in this way. The "mosaic" process differed from the other by cutting the bar into short lengths and fagoting these pieces, the cut surfaces always being placed so as to face outward. Blades of great excellence were thus produced, but still inferior to the genuine Damascus. It was not till after the investigations of Gen. Anossoff in the first half of the 19th century that successful reproductions were obtained. These researches led to the

establishment of works at Zlatoosk in the Ural Mountains, where Anossoff manufactured Damascus steel by processes of his own invention. According to his best method 11 pounds of iron were melted in the crucible with one twelfth as much graphite and one thirty-second part of scales of iron. All his sword blades were tempered in boiling grease. The process of bringing out the watered appearance was accomplished by the use of a diluted acid, which acts more upon the ground than upon the lines. The Zlatoosk weapons proved to be of properties similar to those of the old Damascus blades. Gen. Anossoff with one of them cut through floating gauze. Bones and nails may be cleft without injury to blades tempered for such use, and other steel tempered to the same point may be nicked by them without causing a gap. Their elasticity is so great that one may put his foot upon the end of the blade and bend it to a right angle, when it will fly back perfectly unchanged. Gen. Anossoff died in 1851, and his successor at the works failed to produce the remarkable blades for which the establishment had become celebrated.

Damascus Iron, or **Damascus Twist**, iron produced by the following method: Twenty-five alternate bars of iron and mild steel, each about 2 feet long, 2 inches wide, and ¼ inch thick are united by welding; the fagot being drawn into a bar ⅜ inch square, is cut into lengths of 5 or 6 feet. One of these pieces is heated to redness, and one end is held firmly in a vice, while the other is twisted by a wrench or tongs, which shortens the rod to half its length and makes it cylindrical. If two of these twisted pieces are to be welded together, they are turned in diverse directions, one to the right and the other to the left; these are laid parallel to each other, welded and flattened. If three rods be used, the outside rods turn in a direction the opposite of the middle one, and this produces the handsomest figure. By these operations the alternations of iron and steel change places at each half revolution of the square rod, composed of 25 laminæ, the external layers winding round the interior ones; thus forming, when flattened into a ribbon, irregular eccentric ovals or circles. The fineness of the Damascus depends upon the number and thickness of the alternations.

Dam'ask, a textile fabric, the ground of which is bright and glossy, with vines, flowers, and figures interwoven. At first it was made only of silk, but afterward of linen and woolen. According to the opinion of some, this kind of weaving was derived from the Babylonians; according to others, invented at a later period by the inhabitants of Damascus, from which latter place it is known to have derived its name. The true damasks are of a single color. In modern times the Italians and Dutch first made damask; and Europe was supplied, as late as the 17th century, from Italy alone, chiefly from Genoa. But the French soon imitated it, and now surpass the Italians. Damask is made in great quantities in Germany, chiefly in Upper Lusatia. Dunfermline is the chief seat of the manufacture of damask linen in Scotland, and Lisburn (q.v.) and Ardoyne in Ireland.

Damask Designing and Manufacture. To trace the origin of the art of weaving, or to ascertain the name of the artisan whose necessities led him to devise the crude appliance capable of being used in the production of even the very coarsest woven material, would be a hopeless task indeed, separated, as we are, from a period so exceedingly remote by the impenetrable gloom and obscurity which must ever enshroud the events of three or four score centuries ago. And yet we are safe in assuming that the ability to produce woven fabrics by means of a loom, no matter how elementary in construction, far antedates all written history, carrying us back to those early ages when the first rays of the sun of progress were faintly discernible above the horizon of time, awakening within our humble ancestors the desire for those things, which when obtained served to lighten their toil, and at the same time form part of the foundations of the noble structure, to which successive generations have contributed their share, and which we call civilization.

Coming down to a later period, however, we are enabled to gather authentic information regarding the degree of progress made in the art of weaving. Trustworthy records dating as far back as 2000 B.C. reveal the fact that the weavers of ancient Egypt were far advanced with the production of plain woven fabrics, many excellently preserved fragments of fine linen, which have been taken from the mummy cases of that period, testifying not only to the reverence with which they regarded the embalmed remains of their illustrious dead, but also to their skill and proficiency as weavers.

In the Bible also we find numerous references to the products of the loom. Job speaks of his days as being swifter than a weaver's shuttle (Job vii. 16). We also read that the draperies of the tabernacle and the veil of the temple were woven fabrics, richly embroidered with various colors. These allusions to the art of weaving, and others too numerous to mention, are scattered profusely throughout the pages of the sacred volume; while heathen writers of antiquity frequently allude to weaving as an art which was held in the highest esteem, and which furnished a favorite occupation for people representing every grade of society, from those who dwelt in the marble halls of princes down to the occupants of the most humble dwellings.

Nor was skill in weaving confined to one locality or people; an art so essential to the comfort and welfare of humanity at large, must speedily have become the common property of widely separated races; consequently we find that the Babylonish weavers of the year 1000 B.C. were celebrated for the richness and quality of their woven fabrics; while at the same period the patient Hindu and the stolid Chinese were producing fabrics of the finest texture on looms of the most primitive description.

From this it is obvious that the ancient races were familiar with the principles of fabric construction, and that they were able to produce a considerable variety of elementary weaves by using different varieties and counts of yarn in combination with each other; yet there is nothing to show that they were acquainted with any form of loom, the mechanism of which made possible the production of intricate floral or ornamental designs, such for example as could easily have been woven on the draw loom of a later period, or by its successor, the highly improved Jacquard power loom of the 20th century. This obvious drawback, however, they endeavored to overcome by means similar to those employed

by modern manufacturers of textiles, who, in order to meet the demand for showy and inexpensive fabrics of a certain description, are accustomed to arrange either the warp or filling in the form of a series of stripes of contrasting colors, harmoniously arranged together or else by changing the color of both warp and filling at such intervals as a previously devised pattern indicates, are enabled to produce an extensive variety of checkered patterns.

Designs of this character the weaver of ancient times found no difficulty in creating, but any large ornate or floral patterns with which he was familiar, were obtained either by printing, or the skill of the embroiderer, or when considered desirable, a combination of both added to the woven material after it had passed from his hands, and which as a result cannot be classed with those fabrics, which, produced entirely on the loom, are valuable on account of the elaborate nature of the designs with which they are embellished, as much as by the costliness of the materials employed in their construction.

It will thus be seen that a loom which could only be used in the production of a comparatively restricted variety of designs was sure to be superseded sooner or later by one of a more highly developed type, which would allow the decorative instinct of the early textile artist greater opportunity to express the ideas suggesting themselves to him.

In due time a loom capable of accomplishing these results was invented, probably in China, where, like so many other relics of the long forgotten past, it may be seen in operation at the present day, although long since consigned to the rubbish heap in all progressive countries.

From China the draw loom, as it came to be called, found its way to other parts of the globe. But it remained for the weavers of the ancient city of Damascus, the capital of Syria, to develop the possibilities of the new loom to the utmost extent, with the result that in time they established a large manufacturing and export trade in the beautiful silken fabric which soon became widely known as damask, taking its name from that of the city to which for centuries it brought wealth and renown, and in the manufacture of which the Damascene excelled all competitors.

In regard to the fabric itself, it and various other weaves, now passing under the same name, will be analyzed and described farther on, but any detailed description of the now thoroughly obsolete draw loom would be out of place and of no value to the average reader, but those desirous of making a thorough study of the subject will find their curiosity gratified by consulting the excellent treatise on hand loom weaving by Murphy, published during the early part of the 19th century.

Stated as briefly as possible, however, it may be said that the draw loom tie-up was a compound arrangement, one part of the harness being controlled by a lad known as the draw-boy, the other part controlled by shafts for the purpose of subdividing the warp, so as to form the fine ground weave peculiar to damask fabrics. Just as the weaver was about to throw the shuttle across the lathe, the warp, of which there may have been five, six, seven, or more ends to each mail, according to the quality of damask desired, was raised *en masse* by the draw-boy in accordance with the requirements of a previously painted pattern, all the remaining warp being left down. The shuttle would thus have passed under the warp raised and over the warp left down without interlacing or forming cloth, had it not been for the supplementary arrangement of harness shafts, through which the entire warp was drawn, for the purpose of enabling every end to be used separately.

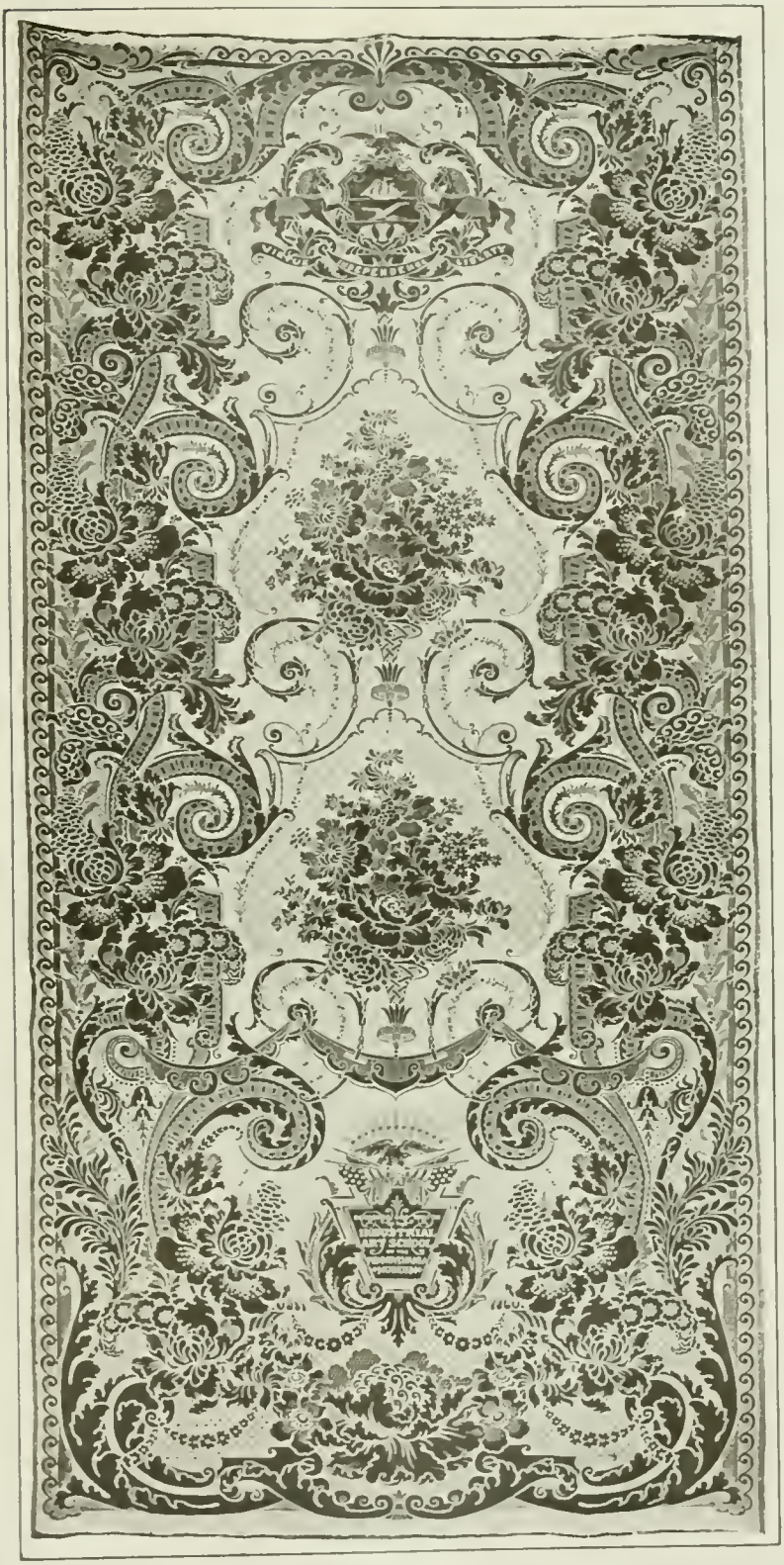
For each pick one of these shafts would be raised and one depressed, the others remaining undisturbed, the shaft which had been raised lifting every eighth end from among the mass of warp left down, the shaft which had been depressed carrying down with it every eighth end from the mass of warp raised, while the shafts which remained in a neutral position were so constructed as to permit the lifting of one portion of the warp and the sinking of the remainder as called for by the design, without interfering with the shed or passage of the shuttle. By this means the pattern was formed and the warp and filling interwoven so as to produce an eighth shaft satin or any similar weave required.

During the wars of the Crusades the draw loom, along with many other things Oriental, found its way into various European countries, thereby aiding greatly the development of weaving as applied to silk damask, brocade, velvet, and other fabrics; the great artists of the Middle Ages not considering it beneath their dignity to supply the necessary designs for these rich textiles. For centuries, however, the draw loom remained practically the same as when first introduced, but in the year 1604 a Frenchman named Simblot devised a method by means of which the draw-boy was enabled to raise the warp while standing at the side of the loom, instead of the top, as had been the custom previously.

In England also, during the 17th and 18th centuries, patents were taken out for several devices intended to render the services of the draw-boy unnecessary; these, however, soon passed from public view, but the draw-boy remained, toiling away at his monotonous task for many a day after the mortal remains of Jacquard had crumbled to dust.

In the United States the manufacture of the finer grades of silk and cotton damask and upholstery fabrics in general is of comparatively recent origin, the vast majority of looms devoted to this industry being located in Philadelphia, with lesser numbers scattered throughout New York State, New Jersey, Connecticut, and Virginia.

Twenty-five years ago the business was in its infancy, but "mighty oaks from little acorns grow," and to-day the manufacture of upholstery goods is one of the most important industries of the country, which, with allied trades, such as yarn-spinning, dyeing, and the manufacture of textile machinery, provides the means of livelihood for tens of thousands of operatives, and at the same time is a standing monument to the business enterprise of the American manufacturer. Nor have we by any means reached the limits of our development in this direction; the remarkable inventive ingenuity of the American artisan, which in many other lines of business has practically placed him beyond the reach of competition, will not be likely to fail him when applied to the weaving industry.



Silk Damask Curtain. Designed by William Laird Turner. Exhibited by the Philadelphia Textile School at the Chicago World's Fair. 210 ends per inch. 120 picks per inch. Pattern on design paper covered 174 square feet. 28,320 cards required to form the design on cloth, which placed end to end would extend a distance of 7¾ miles. The largest pattern designed in the United States, up to 1893.

We will now consider the machine which time and experience has clearly demonstrated to be the most valuable contribution to the art of ornamental pattern weaving yet devised, and which owes its usefulness to the ingenuity of Joseph Marie Jacquard (an artisan of Lyons, France, born in the year 1752), although a large share of the honor bestowed on Jacquard is really due several others who endeavored during the early part of the 18th century to improve the draw loom. M. Falcon, for example, in the year 1728 invented a method of raising the warp by means of a chain of cards, on which a pattern was represented by holes perforated thereon, the cards being adjusted to a square cylinder also perforated to match a fully punched card. M. Vaucanson is also entitled to credit for improving the cylinder and causing it to revolve and move backward and forward with the cards. He also invented the griffe, which had for its object the raising of the warp; but these inventions, although constituting the essential features of the Jacquard machine, never passed beyond the realm of experiment until about the year 1801, when profiting by the experience of his predecessors after careful study of the problem, Jacquard introduced the machine which bears his name, and revolutionized the art of weaving.

The Jacquard machine may be defined as a piece of mechanism placed above a loom for the purpose of raising warp in any possible order a previously designed pattern may indicate.

The framework is of iron, strongly built, in order that the various parts may stand the strain to which they are subjected during the process of weaving. The steel hooks or wires which raise the warp are placed in an upright position, the needles occupying a horizontal position. Every needle is connected to a hook in such a manner that when the needle is pressed back by a card the hook is carried back also. A spring at the end of each needle sends both hooks and needles back to their original position. Each hook has a crook at the lower as well as the upper end. To the crook at the lower end the harness cords are fastened, and at the lower end of the harness cords the heddles are attached. In the centre of each heddle a small metal eye called a mail is fastened. Through the eye of the mail the warp is drawn. Below each heddle an iron weight called a lingo is attached for the purpose of keeping harness cord, heddle, mail, and warp in the proper position.

An important part of the machine is called the griffe. It is an oblong iron frame containing as many strips of iron called the bars, or knives, as there are rows of hooks lengthways in the machine. Each of these bars rests directly under the upper crooks of the hooks. The griffe has a rising and falling motion. When it moves upward it raises all the hooks whose upper crooks rest directly above the bars or knives, allowing those hooks which have been pushed aside by the card to remain down.

Another important part of the machine is the cylinder, on which the cards are carried backward and forward, to and from the points of the needles when the loom is in operation. It has four sides, each side being perforated with as many holes as there are needles in the machine, or holes in a fully punched card.

To control the movement of the hooks a pattern is painted on squared design paper. If it is to be woven by means of a 400 machine the designer cannot use more than 400 small squares from right to left on design paper; or, if the pattern is to be woven by a 600 machine, he cannot exceed 600, or 1,200 if made to suit a 1,200 machine, unless he makes use of hooks belonging to two extra rows, with which Jacquard machines are usually furnished. Neither is he compelled to use the full number of hooks available, as the pattern may be subdivided into two, four, six, or any number of parts required, but it would be necessary to paint out the full extent of the design unless the first part could be reproduced on an even number of rows, in which case the card stamper would go over the part painted as often as necessary, in order to indicate the complete number of harness cords on the card.

When the pattern has been completed it is given to the card stamper, who punches holes in the cards wherever the design indicates that warp is to be raised.

When the cards have all been cut they are laced together in regular rotation and placed upon the cylinder, around which they revolve in an endless chain. The loom is then started, and the cylinder carrying the cards with it moves toward the needle points, against which they are pressed. Where no holes have been punched, the card forces the needles back. The needles carry the hooks with them out of the way of the griffe bars, which rise at the same moment. This allows the warp to remain down, resting on the shuttle race, but where holes have been punched in the card, the needles enter, allowing the hooks to remain undisturbed, their upper crooks resting directly over the griffe bars, which, when rising, lift hooks, harness cords, and warp, forming a shed through which the shuttle passes.

From this it will be evident that to raise warp, holes must be punched in the card, and where warp is to be left down, the card must be left uncut. The Jacquard machines generally used in the manufacture of upholstery fabrics range in capacity from 624 to 2,608 hooks. Within recent years a new machine known as the fine index Jacquard has come rapidly into favor. It is more accurately built than the older type known as the French index machine, and contains 80 full rows of 16 holes, and 24 extra holes on the peg hole rows, or a total of 1,304 holes on one card, a little larger than a 624 hook French index card.

For weaving fine damask goods, the machines generally used are known as double lift, single cylinder Jacquards, while manufacturers of such fabrics as turkey red damask table covers, use the double lift, double cylinder machine; another Jacquard called the rise and drop machine is also much used by upholstery goods manufacturers, these Jacquards being operated at a considerably higher speed than is obtainable with an ordinary straight lift, single acting machine.

In the double lift single cylinder machine, for example, there are double the number of hooks contained in a single lift Jacquard of the same capacity; although each has the same number of needles, there are also two griffes which work alternately, thus enabling the loom to be driven at a higher rate of speed, each griffe and the hooks it controls coming into operation at

each alternate pick only, thereby avoiding unnecessary friction of both machine and warp.

In the double lift, double cylinder Jacquard, the pattern cards are divided into two sets, all odd-numbered cards being placed on one cylinder, and evenly numbered cards on the other. When the loom is in operation the cylinders come into play alternately, the odd cards and cylinder for the first pick, the even cards and cylinder for the second pick, and so on, each cylinder working at the rate of about 70 picks per minute, or 140 for both.

In addition to these machines there are a considerable variety of other makes adapted or modified to suit special conditions. The twill Jacquard, for example, designed to weave fine damask and other fabrics requiring a great number of warp ends with a machine of small hook capacity, the Jacquard in this case weaving both figure and ground, thereby greatly reducing the cost of designing and card-stamping. The cross border Jacquard is the name given to another style of double cylinder machine used for weaving table covers and border fabrics. In this case the cards for weaving the border are placed on one cylinder, and those forming the centre on the other, each cylinder being called into action to weave its own part of the pattern only.

Other varieties of machines might be mentioned, but those already referred to are sufficient to show that a Jacquard machine which might be perfectly adapted to a certain class of work would probably be of little use for anything else.

The "tie-up" is the technical term applied to the method by which the various harness cords controlling the warp are connected to the hooks of the machine, in order to form the elaborate patterns required for Jacquard woven fabrics in general.

The tying up may be accomplished in the three following ways: (1) By what is termed the straight tie method; (2) by the point or centre tie method; and (3) by those two methods in combination.

When the harness is tied up so that each end in the warp is controlled by a separate hook, it is known as a straight through single tie, which, for designing purposes is the best possible arrangement of the harness cords, as it enables the designer to execute a pattern extending from selvage to selvage without being compelled to repeat any portion unless found desirable. This method of tying up is rarely ever used, however, unless for narrow fabrics, or large panels woven in imitation of Gobelin tapestry, on account of the great expense it would necessarily involve for designing and card stamping, the manufacturer finding it much more economical to use the straight repeated tie, or the point tie, by means of which he could weave with a 1,200 machine, a damask or tapestry curtain, for example, containing 9,600 warp ends, in the full width of the fabric, by tying up the harness so that the pattern would be repeated eight times, to accomplish which the comberboard would require to be separated into eight equal divisions, each containing 1,200 holes and the same number of harness cords, the first cord from each division being connected to the first hook, the second cord from each division to the second hook, the third cord from each division to the third hook, and so on, so that by raising any particular hook eight warp ends would be lifted, one from each division, all forming a portion of the design exactly alike, each in its own division.

From this it will be evident that the number of times a pattern may be repeated in the width of the fabric depends upon two things. In the first place, upon the number of hooks which the machine contains, and in the second place, upon the texture of the fabric to be produced, the finer the texture the greater the number of hooks necessary, in order to form a wide repeat.

The second tie-up referred to, the point, or centre tie, is generally adopted when the manufacturer desires a larger and more imposing style of design than is obtainable with the ordinary straight repeated tie.

For example, by using a 600 machine tied up straight, so as to give a warp texture of 100 ends per inch, the width of one repeat of the pattern would be limited to six inches, but by tying up the same number of ends per inch, using the point or centre tie method, the width of one repeat of the pattern would be 12 inches, and the number of harness cords and warp ends 1,200, controlled by 600 hooks.

This tie-up has one disadvantage, however, as it can only be used in the production of designs which are symmetrical, or alike on both sides of a line drawn from top to bottom, in the centre of the full repeat. In regard to the arrangement of harness cords for curtains, table covers, etc., for which this tie-up is much used, the first hook in the Jacquard machine is generally made to control two harness cords in the exact centre of the comberboard, the last hook controlling two harness cords, one of which is at the extreme left, and the other at the extreme right of the comberboard.

The combined point and straight tie is used principally for curtains, table covers, couch covers, and other fabrics requiring side borders, this method being adopted because the pattern repeat can be increased thereby. For fine weaves, however, a machine more limited in capacity than a 1,248 hook French index, or the 1,304 hook fine index Jacquard, will hardly be found serviceable, the 600 machine restricting the designer to very small patterns, which, while cheapening the cost of production a trifle on that account, and because fewer cards are required, would still be unprofitable, as the woven product could not compete with goods of the same texture ornamented with larger and more imposing designs; however, for cheap fabrics, such as turkey red damask, the 600 machine is commonly used, with the harness tied up to give a straight tie centre and a point tie border, with a warp texture of from 60 to 70 ends per inch, finished goods.

In medium grade fabrics the warp generally varies between 90 and 100 ends per inch, the 1,248 or 1,304 hook machine giving a curtain 50 inches wide, containing 4 straight repeats of 1,200 ends each, equal to 96 ends per inch, but as a curtain without a border is more or less unfinished, the machine could be used to greater advantage by dividing the hooks into two parts, the first 600 tied up point tie in three 12½ inch repeats, and the second 600 tied up straight, so as to give two borders, each six and a quarter inches wide, by which means the full width of 50 inches would be secured.

For the finest fabrics where extensive single scale patterns are necessary, larger machines must be used, but if the cost of production must be reduced to a minimum, compound harness shafts may be used, with as many ends to each mail as are necessary to obtain the desired result.

When tying up has been completed, the loom is then ready for the warp, which for cotton damask and similar fabrics is generally delivered at the mill by the cotton spinner, undyed, and in chain form, spun to the counts or number wanted, the length of the chain and the number of ends it may contain varying to suit the requirements of different manufacturers, chains from 500 to 600 yards long and containing 1,200 ends being commonly used for 50 inch wide cotton damask fabrics, with a warp texture of 96 ends per inch, finished goods, a warp of this description requiring four chains, each containing 1,200 ends, in order to make up the full warp of 4,800 ends.

After the warp has been dyed the necessary color, it is sent to the beamer, who begins by taking the ends of the warp containing the pin lease, which he twists around several wooden pins on what is known as the rack, in order to regulate the tension with which it passes around another tension device, composed of three large hollow wooden rollers, or drums, as the beamers call them; the warp is then, by means of the pin lease, passed through the dents of a coarse reed suspended from the ceiling, then distributed over a second fixed reed to the required width, which is usually a little in excess of the width of the warp in the loom reed. Thence it is passed under two iron rollers, the second of which presses the warp down on the beam, causing it to go on firmly; it is then fastened to the beam, and the actual work begun, the beamer standing eight or ten feet from the beam, using the coarse hanging reed already referred to for the purpose of unraveling the warp, and causing it to pass through the fixed reed and on to the beam evenly, great care being exercised in order that all slack, crossed, or broken ends may be adjusted, this being absolutely necessary in order that the weaver may be saved annoyance and loss of time when the warp is in the loom.

The foregoing description applies to warps which can be beamed directly from the chain, but the warp for many varieties of cotton fabrics is not strong enough to stand the friction and strain of weaving, and requires different treatment previous to beaming.

Sea Island cotton, grown in the Fiji Islands, for example, has the longest fibre of any variety, the length of which runs from 1.25 to 1.90 inches, with the American variety of Sea Island cotton a close second, it varying between 1.60 and 1.80 inches, while Texas grown cotton is shorter in staple than any other variety, running between 0.70 and 0.95 inches. From this it will be seen that a single or slack twisted thread will be materially strengthened if coated with some starchy substance, the basis of which may be flour, starch, sago, or any other suitable medium. This is what is done, and the process involved is termed dressing the warp, special machines being required for the purpose.

Cotton, however, is not the only warp so treated. Linen warp for table damask is also dressed before beaming, the object being not only to enable it to stand the friction of weaving, but because by that means the cloth takes on a superior finish, which is one of the desirable features of table damask, and which enhances its value accordingly.

In regard to silk, the most beautiful and costly yarn employed in the manufacture of textiles, it is extensively used both as warp and filling, in the finest grades of silk damask and brocades.

As it comes from the cocoon, or covering with which the silk-worm protects itself when in the chrysalis stage of its existence, it is too delicate to have any commercial value, but during the process of reeling four, five, or six threads are taken from as many cocoons and formed into one fine continuous thread, called singles, the reeling being accomplished by placing the cocoons in warm water, which softens the natural gum they contain and binds the group of separate strands into a single thread.

Tram silk is the name by which reeled silk filling yarn is known, two or more singles being loosely twisted together for that purpose.

Organzine is the name given to reeled silk warp yarn. It also is formed with singles, twisted separately, then doubled and twisted again, thus forming a remarkably strong and brilliant thread.

Spun silk is also in great demand for fine damask warps. It, however, has not the brilliancy of reeled silk, being formed with cocoons which have been pierced, or otherwise spoiled, and which, along with the refuse and waste accumulating during the reeling process, is torn up, then carded, and spun to the counts or number desired.

In regard to the warping and beaming of silk, it may be said that organzine and spun silk warp used in the fine silk damask trade, is bought in skein form, and in the gray, which, after being dyed, is wound on large bobbins, then transferred to the warping mills in sections, the creel on which the bobbins are placed not being large enough to hold all the bobbins necessary for the completion of the entire warp at one operation. After the warp has been put on the mill it is wound around the beam; when this is finished it is taken charge of by the twister, whose duty it is to twist the ends of the new warp to the corresponding ends of a short length of the old one which has been left in the loom for that purpose; but in the case of a new tie-up, or any change in the arrangement of the mails, which occurs when a straight tie for single warp fabrics is altered to suit a two or three warp weave, without cutting down the harness, the old warp would require to be taken out of the loom, and the new warp drawn through the mails and reed as required, before being ready for weaving.

Wool, jute, ramie, and other yarns are also used in the manufacture of damask fabrics, but the foregoing description will furnish a general idea of the warping, beaming, and twisting operations involved.

The next thing to be considered is the designing of patterns for Jacquard fabrics, this subject being one of vital importance to the manufacturer of high class ornamental textiles, the prosperity or decline of a business of this character depending in a great measure on the artistic ability of those responsible for each season's patterns.

Those unfamiliar with textile designing will probably imagine that the creation of new pat-

terns lies entirely with the designer, which to a certain extent is true, but, generally speaking, the designer is the medium through which the ideas of the mill owner, manager, salesman, or other supposed expert find expression. If this important work is performed by a man of refined taste, in close touch with the trade, and always on the lookout for novel ideas in weave and design, if he is or has been a good original designer, and is familiar with fabric construction, so much the better. The business fortunate enough to possess a man with these qualifications will always secure its share of whatever trade is being done; but, unfortunately for some manufacturers, the designer is looked upon as of no more value to the firm than the man who oils a machine and keeps it running, while the head of the department may recently have been employed as a weaver or card-stamper, who, because of fancied executive ability, has been placed in charge of this important department, with the result that his first thought is to secure the cheapest men on the market, who produce work, which, from lack of proper training, he cannot perceive to be common and devoid of originality, and which, instead of creating dividends, will in time sap the foundations of what might have been, under proper direction, a profitable business.

Among small manufacturers the usual custom is to buy all patterns required from designers who work for the general public, but large concerns as a rule consider it more advantageous to employ a staff of draughtsmen, under the supervision of a head designer, who, in addition to ability as an artist, originator, and colorist, should be familiar with the Jacquard machine, the various methods of tying up, card stamping, and fabric construction. Men with these qualifications are not easily obtained, the technical man as a rule being of no use as an originator, while the designer capable of executing good original work, generally looks with indifference, if not contempt, on the various mechanical operations by which the design is transferred to the cloth, and fails to realize the importance of mastering these details until he finds himself outclassed by one who equals or excels him as an artist, and who, in addition, has burned the midnight oil, in order to acquire the technical knowledge which renders his services valuable.

When the designer is commissioned to prepare a pattern for any of the finer grades of Jacquard fabrics, silk damask furniture covering for example, he first prepares a rough charcoal sketch, drawing the figures the same size as they will appear in the cloth; when satisfied with what he has done, he takes a sheet of tracing paper and goes over the drawing carefully, making the outlines definite, and introducing improvements wherever possible. This carefully drawn tracing is then transferred to a sheet of drawing-paper, on which a background of a suitable color has been previously painted. When this is accomplished, the sketch is painted to resemble the finished cloth, after which it is left for the manufacturer or his representative to decide whether or not it shall be given to the draughtsman to transfer to squared design paper.

On the other hand, some manufacturers consider it a waste of time to prepare a painted sketch, and in the case of designs for many of the coarser grade of textiles, and for one warp one shuttle weaves, such as cotton or linen table damask they are right, a shaded outline sketch being sufficient, but for silk damask and other high grade upholstery fabrics, where fine drawing and careful coloring are essential, a cloth-size painted sketch should always be prepared, not merely as a guide to the draughtsman and colorist, but because it is the only way to secure the best results.

After it has been decided that the sketch may be proceeded with, it is given to the draughtsman to transfer to squared design paper, the simplest and best way to accomplish which is by using the diverging scale, by means of which the sketch may be speedily and accurately ruled into as many squares as there are large squares in one full repeat of the pattern on design paper. Suppose, for example, that the sketch was for cotton damask goods, a 1,200 Jacquard machine being used, the cloth texture being 100 ends warp and 50 picks per inch, 1,200 hooks in one full repeat divided by 100 hooks per inch shows one repeat of the pattern to be 12 inches wide. The design paper necessary for the reproduction of this sketch may be 16 x 8, 12 x 6, 8 x 4, or any paper giving the proportion of 100 ends to 50 picks. Supposing that the draughtsman decided to use 16 x 8 paper, he would ascertain the number of squares into which the sketch should be ruled from left to right by dividing 1,200 by 16, which would give 75, that being the number of large squares in one repeat of the pattern, on design paper. Should this, in his estimation, cut up the sketch into too many squares, he could rule it into half that number, and mark the design paper to correspond.

When the sketch has been squared in this manner, the drawing is copied free-hand from the small squares on the sketch to the larger ones on design papers, this being continued until the whole pattern is reproduced in outline. It is then checked out with colors, representing those on the sketch, although generally brighter and more definite in hue in order that the card-stamper may have no trouble. When this has been accomplished the work of the designer and draughtsman is at an end, and the pattern is given to the card-stamper to be reproduced on the cards.

For a considerable time after the introduction of the Jacquard machine this was one of the most tedious and expensive operations connected with pattern-weaving, the first appliance for perforating the cardboard being simply a common hand-punch used in accordance with the requirements of the design, a second person reading the order of stamping for the guidance of the one who used the punch.

At the present day the cards are stamped by the piano machine, so called because in some respects it is supposed to resemble the musical instrument of that name, the design being placed on a reading-board in front of the stamper, while the keys which control the punches are operated by the fingers, and the card moved along from row to row by means of two pedals, manipulated by the feet. The machines used for stamping damask and other classes of upholstery fabrics are the French index, made to stamp 12 holes to each row, and the fine index, 16 holes to each row, the card guide in these machines being adjustable and self-centring,

so that cards of different widths may be stamped thereon.

Before commencing to stamp from a design similar to that described, the card-stamper would rule the pattern into 100 divisions across, with lines drawn from top to bottom by means of a lead pencil, each of these divisions containing 12 small squares crossways to each line, corresponding to 12 holes in each row on the card, and 12 needles and hooks in the Jacquard machine, and the same number of ends of warp, the full 100 divisions corresponding to the 1,200 hooks forming the tie or repeat of the pattern, and all the various repeats in addition, by which the full width of the woven fabric is made up.

After the design paper has been ruled, the first half, corresponding to the first 600 hooks and ends, is placed in the reading frame and the work of stamping begun, the pattern being read from right to left, from the bottom line upward, each line corresponding to one pick on one-shuttle work, two picks on two-shuttle work, three picks on three-shuttle work, and so on. When both halves of the pattern have been stamped the cards are laced together by hand or machine, this work being generally executed by boys, who, when inexperienced, occasionally make mistakes by turning the cards around, or upside down, and lacing them when thus misplaced.

For example: a 600 Jacquard machine contains 52 full rows of holes, including the 2 extra rows; total, 624 hooks. If the cards are laced in proper rotation, but turned around so that the first hole in each card takes the place of the 624th, the position of pattern on the cloth would be reversed; that is, figures pointing to the right on design paper would point to the left on cloth, and *vice versa*. With some patterns this would make no difference, as for example, a design composed of two-sided figures, each side the reverse of the other, but should the pattern contain a motto, monogram, or initials, as is often the case with linen damask, to reverse the position of the letters would spoil them entirely.

Another mistake which occasionally happens completely destroys the pattern by cutting it into a series of disjointed stripes, running in the direction of the warp, is caused by lacing the cards in correct rotation, but upside down, thus putting the 12th row of holes in the place of the 1st, which, on a 12-row machine, would cause the 1st row of hooks to control the 12th row of harness cords, the 2d row of hooks to control the 11th row, and the 3d row of hooks to control the 10th row, and so on, which, occurring on every card, destroys the pattern in the manner described.

Genuine damask, the weaving of which will now be explained, may be distinguished from other damask fabrics, so-called, by the fact that both ground and figure are eight-shaft satin weaves, the ground formed by the warp and the figure by filling, or *vice versa*.

In the weaving of single-scale fabrics, each hook in the machine controls a separate harness cord, mail and warp end, in one repeat of the pattern, a 1,200 machine tied up to give 200 ends per inch would thus form a six-inch wide pattern, but if each hook were made to control two warp ends of the same counts, the pattern repeat would be extended to 12 inches, or 18 inches if three ends were used, 24 inches if four ends were used, and so on, but as each group of ends is raised by a single hook, the outlines of the pattern are as a result coarser than if each end were controlled separately.

In order to form the fine ground weave it is necessary that the Jacquard harness be supplemented by an arrangement of shafts similar to those referred to when describing the draw loom; these shafts, which are placed between the reed and the Jacquard harness, have heddles containing extra long eyes, or loops, so that when occupying a neutral position the warp may be raised and depressed by the other shafts as the Jacquard harness is raising the warp in a mass to form the design. For example: when weaving a four-scale damask four ends are passed through each mail of the Jacquard harness, after which they are drawn separately through the heddles of the shafts in front, the first end through the first heddle of the first shaft, the second end through the first heddle of the second shaft, the third end through the first heddle in the third shaft, and so on, until the entire warp is drawn in. It will thus be seen that each shaft controls one eighth part of the entire warp and that if they are raised in proper rotation an eight-shaft satin will be formed.

The rising and sinking of these shafts is controlled by that part of the mechanism of the loom called the head motion, acted upon by the harness chain, certain balls called raisers and sinkers being arranged thereon, the raisers to lift and the sinkers to sink the shafts in the order necessary to form the weave, which for an eight-shaft satin may be as follows:

1st	pick	1st	shaft	up,	5th	shaft	down.
2d	"	4th	"	"	8th	"	"
3d	"	7th	"	"	3d	"	"
4th	"	2d	"	"	6th	"	"
5th	"	5th	"	"	1st	"	"
6th	"	8th	"	"	4th	"	"
7th	"	3d	"	"	7th	"	"
8th	"	6th	"	"	2d	"	"

One repeat of the ground weave is thus formed, and by raising and depressing the shafts in the same order for each successive pick the pattern and the exquisite satin weave for which fine damask is renowned, will be produced simultaneously.

The cost of production is greatly lessened by this method of weaving, as 4,800 hooks would be required to weave a pattern which could be produced by a 1,200 hook machine and a four-scale tie-up. It would also be necessary to paint the pattern on 4,800 small squares from right to left on design paper, as against 1,200 required by the four-scale tie, and if a fine index Jacquard is used, four cards would have to be stamped to represent every pick or line on design paper, instead of one as required by 1,200 hooks, thus giving the weaver four sets of cards to look after instead of one, all this additional labor and expense adding nothing to the value of the fabric beyond improving the outline of the pattern somewhat, which, however, for commercial purposes, would not justify the additional outlay, even if wholly practical.

When selecting the requisite design paper for these fabrics it must be remembered that a four-scale damask may contain 200 ends per inch, but as the entire number is controlled by 50 hooks, that number only must be considered. Should there also be 50 picks per inch, 8 x 8,

10 x 10, 12 x 12, or any paper of the same proportion would be suitable. When painting the pattern, red could be used to represent figure, with the ground left white paper, and as the interlacing or stitching together of warp and filling is effected by the shafts, such would not require to be indicated on the design. The stamping of the cards is regulated by the method of weaving, which, in the case of fine silk damask, showing more ground than figure, is usually accomplished with the face of the cloth down, as this lessens the strain on the hooks and also on the lever which raises the griffe. For example: by weaving an eight-shaft satin face up, seven eighths of the warp would be raised and one eighth left down for every pick, but by weaving the cloth face down, one eighth of the warp would be raised and seven eighths left down for each pick, thereby reducing the strain on the machine to a minimum, and at the same time facilitating weaving. The card-stamper would therefore stamp red figure wherever indicated on the design and miss white.

Among the various fine damask fabrics may be mentioned a double-scale one-shuttle weave used principally for upholstering furniture, and which, in the finer grades, is composed of spun silk warp and tram silk filling. In this case each hook controls two ends in every repeat, the Jacquard harness raising both ends as one, while a set of shafts lifts each end separately in order to form the fine satin ground weave. To make this clear, it must be explained that the cloth is woven face down, and that the cards are cut to raise all the warp indicated by the figure painted red on design paper, while the ground warp represented by white is allowed to remain down. From the warp thus left down the shafts raise every eighth end, but as they do not sink any of the warp which has been raised, in order to allow the shuttle to pass under and form figure, the interlacing of warp and filling in the figure part of the fabric must be indicated on design paper, and represented on the card, with the result that at every point of interlacing two ends are left down, except where a shaft happens to lift one when forming the ground weave, but this is purely accidental, as the stitching of the filling by the warp is always done with the object of showing the silk to the best advantage, and while an eighth or sixteenth shaft satin form of stitching could be designed to suit the raising of the shafts, the floating of the silk filling on the face, one of the beautiful features of this fabric, would as a result be destroyed. This class of silk damask is also woven with two and three filling systems, by means of the same arrangement of Jacquard harness and shafts.

When woven with two systems of filling it is known as two-shuttle work, or three-shuttle work when three filling systems are used. When only two colors are used to form the design it is called a two-steady-shuttle pattern, to distinguish it from the same class of damasks in which one shuttle is steadily employed throughout the pattern, while the other is changed from one color to another a number of times in every repeat of the pattern during weaving, thereby cutting one of the filling systems into a series of horizontal stripes of colors, which the skill of the designer must soften and blend into harmony, by proper selection and skilful use of the steady color.

When selecting square design paper to suit a two-shuttle pattern, only half the total number of picks per inch are taken into consideration. For example: a total of 90 picks per inch on cloth would be represented by 45 lines on design paper, but as two cards would require to be stamped to represent the two picks indicated on each line, the full 90 picks per inch are thus made up. In regard to the warp texture, this varies a little, but 180 ends per inch may be considered about correct, and as 180 ends in a double scale tie-up are controlled by 90 hooks the design-paper selected should be in the proportion of 90 ends to 45 picks per inch, 10 x 8, 12 x 6, 8 x 4, or any similar paper would be suitable.

When selecting colors to represent the cloth effect on design paper, yellow may be used to represent the steady shuttle, and red to represent the changing shuttle, it being unnecessary to represent the changes on design paper if a properly executed sketch has been prepared, and also because a change in shuttle is represented by one card only. The background of the pattern should be left white paper, and the stitching on long filling face floats may also be indicated with white, although black or some other color is preferable on account of white having a tendency to peel off.

In this case the cloth would be woven face down, and the cards stamped as follows: First card yellow pick, stamp yellow, miss white, stamp red plain, that is, one end up and one down. Second card red pick, stamp red, miss white, stamp yellow plain.

Analysis of card stamping: First card, yellow pick. Stamping yellow raises all the warp represented on design paper by yellow, and allows the yellow pick to go under and form figure on the face, except where stitching takes place as indicated by white on yellow.

Missing white, allows the warp to remain down in a mass, wherever indicated on the design, except where ends are raised, at regular intervals, by the shafts to form the satin ground weave.

Stamping red plain, raises one half of the warp and leaves the other half down wherever red is indicated on the design, thus forming a plain weave with the yellow pick and the warp on the back of the cloth.

Second card, red pick. Stamping red raises all the warp represented on design paper by red, and allows the red pick to go under and form red figure on the face, except where stitching takes place as indicated by white on red.

Missing white, allows the warp to remain down in a mass wherever indicated on the design, except where ends are raised at regular intervals by the shafts, to form the satin ground weave.

Stamping yellow plain, raises one half of the warp, and leaves the other half down wherever yellow is indicated on the design, thus forming a plain weave, with the red pick and the warp on the back of the cloth.

The lifting of the shafts to form a satin ground weave is generally accomplished by means of certain rows of hooks reserved at each end of the machine for that purpose, the order in which they are raised being indicated on the corresponding rows at the ends of both cards.

Brocatelle is the name given to another variety of silk damask containing several ends to

each mail. As originally woven, the warp was silk, and the filling silk, cotton, or wool. At the present time the term brocatelle is applied to a two-warp two-shuttle fabric used principally as furniture covering. Owing to the nature of the weave, the pattern, which may be formed by spun or organzine silk warp, on a tram silk filling ground, has a rich embossed appearance. The second warp, technically called the binder warp, may be either silk or fine cotton yarn, and is used for the purpose of stitching long floats of the tram silk pick on face and back, usually by means of four shafts forming a three-up and one-down straight twill; while the back pick is generally fine jute or linen the same color as the silk figure warp with which it forms an eight-shaft satin, also by means of shafts.

Designs for brocatelle should be treated in a bold conventional manner, with very little attempt at shading, which destroys the embossed effect of the pattern, and makes the fabric look cheap and common. The figure may be represented on squared paper by red, and the ground left white paper, and as the stitching on both picks is done by shafts, no indication of the same is required. The stitching of the silk pick by the binder warp is done by the head motion; but the satin weave formed by the silk figure warp and the backing pick, is indicated on certain rows at each end of the backing pick card, reserved for that purpose.

Brocade is the richest and most elaborate form of silk damask. It is structurally the same as the two- and three-shuttle damask referred to, but gold and silver filling are often used along with silk in order to enhance the beauty of the fabric.

In each case where reference has been made to the use of shafts they have been described as occupying a position at the back of the reed, and in front of the Jacquard harness, but during recent years a different method of using compound harness has come into use, the new shafts consisting of thin strips of wood hung lengthways, immediately below the Jacquard, and connected by means of cords to rows reserved at each end of the machine, for the purpose of raising them in satin order. The Jacquard harness cords are threaded through holes running from top to bottom of these shafts, so that when the Jacquard lifts, the cords are raised also without disturbing the shafts.

To illustrate: we will suppose that a 16-row fine index Jacquard is to be used for the production of double scale damask, with an eight-shaft satin ground. In this case the total number of ends in one repeat of the pattern would require to be divisible by eight, so that the satin might join at both sides of the repeat, and as the fabric desired is a double-scale weave, each row of 16 hooks would have to carry two shafts, equal to a total of 32 shafts, each controlling one thirty-second part of the warp, so that by raising four shafts in correct order for each pick an eight-shaft satin ground weave would be formed.

By using shafts in this manner there is less strain put upon the warp, as there is a separate harness cord and mail for each end, and no front shafts to trouble the weaver, who, as a result, will find it less difficult to tie in broken ends.

The cheaper grades of damask, embracing worsted hangings, table linen, cotton turkey red, and several other one-warp, one-shuttle weaves are designed and woven on the same general principle, one hook controlling a single harness cord and end; in each repeat of the pattern the square design paper also being in proportion to the exact number of ends and picks per inch, one color on the design representing all the various satins, twills, and shadings of the cloth; while the cards are stamped, and the cloth woven face up, or face down, according to the nature of the particular weave.

William Laird Turner,
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Damaskeen'ing, the art of inlaying iron or steel with other metals, especially gold and silver. It is also known as damascene work. This art is of great antiquity. Herodotus mentions a dish so ornamented; and the shields of some of the forces of the Samnites who fought against Rome were damaskeened. This method of ornamentation was formerly much used in Damascus and is found in modern Persian objects of art. The most beautiful specimens are produced by cutting into the metal with a graver and other tools proper for engraving on steel, and afterward filling up the incisions with a pretty thick gold or silver wire. The cuttings should be made in a dovetail form, so that the wire which is inlaid may adhere the more strongly. An inferior style of damaskeening can be produced by the electrotype process. The pattern is etched on the steel, and gold or silver deposited in the etched lines.

Damasus, the name of two popes. 1. Saint Damasus I. was of the Hispanic race, born about 304, but from an early age he was employed as an inferior minister in the service of the Roman see. He was elected to the papacy 366; but as his election was displeasing to a strong faction in the city they set up a rival Pope, Ursinus. In a riot between the supporters of the two claimants of the papal chair in the Liberian Basilica, represented now by the Church of Santa Maria Maggiore, 137 persons, men and women, lost their lives; and Ammianus Marcellinus, the pagan historian, whose testimony is naturally hostile, declares that the ardor of the rivals to seize the episcopal seat surpassed the ordinary measure of human ambition. But ecclesiastical writers of the time make no mention of the 137 persons said to have lost their lives on this occasion, and its authenticity rests on the narrative of Ammianus alone. Prætextatus, the magistrate, who restored tranquillity to the city, is said to have remarked to the successful Pope, "Make me bishop of the city of Rome and I will straightway be a Christian." Damasus was on terms of intimate friendship with St. Jerome, who was his secretary and counselor, and it was at his pressing instance that Jerome made a new revision and translation of the sacred Scriptures. In his pontificate the Emperor Valentinian I., 370, enacted a law designed to correct a grave abuse which had arisen in the Church — the custom of priests and monks receiving from wealthy penitents, especially women, gifts and legacies for themselves. Valentinian's law now made such gifts and bequests void; further it forbade ecclesiastics and monks to frequent the houses of widows and virgins under severe penalties. It is said that Pope Damasus himself

suggested this law to the emperor, as a means of correcting the abuse at which it was aimed. St Jerome mournfully confesses the shame he himself felt that the law should have been necessary: "It shames me to say it," he writes, "but idolatrous priests, jockeys (*aurigæ*), and play-actors, and prostitutes come into inheritances; only to clerks and monks is it forbidden by this law. And the prohibition emanates not from persecutors but from Christian princes. Nor do I complain of the law; but I grieve because we have deserved this law." Damasus died 384. His feast is observed 11 December. 2. Damasus II. was born in Bavaria, and at an early age was ordained a priest. Later he was consecrated bishop and received the appointment to the diocese of Brixen in Tyrol. In 1047 he was elected Pope, but lived only 23 days after being raised to the pontificate.

Dam'bonite ($C_6H_6(NO_3)_6$), a white crystalline substance existing to the extent of 0.5 per cent in caoutchouc obtained from an unknown tree near the Gaboon, in Africa. It is extracted either by cautious sublimation, or by exhausting the dried juice with alcohol. It forms hexagonal crystals, without odor, but with a sweetish taste.

Dambul, dăm-bool', Dambool, or **Dambulla,** a village in the island of Ceylon, at the junction of four lines of road, 70 miles northeast of Colombo. It takes its name from the rock Dambul, a large mass of gneiss and mica schist which rises 550 feet above the surrounding plain, and contains a number of caves, one of them with a long inscription relating to the government of Ceylon in the 12th century, and another with a colossal statue of Buddha hewn out of the rock. The priests of Buddha still officiate in these cave temples.

Dame (Lat. *domina*, mistress), a title of honor which long distinguished high-born ladies from the wives of citizens and of the commonalty in general, and which still is the legal title in Great Britain of a baronet's or a knight's wife. In consequence of the greater courtesy shown toward women of higher rank, arose the custom of prefixing the word *ma* to *dame*, as a special proof of veneration and homage. Hence, too, the virgin-mother was called in France *Notre Dame* (*our* lady, as if no single Christian could exclusively claim the privilege of serving her with the homage of his heart). The daughters of the king of France, as soon as they came into the world, were called *madame;* and this was also the sole title of the wife of the king's eldest brother. In England, the word dame, though not much used, is now applied to married women of all classes. It is also applied particularly to the mistress of a small elementary school, especially if elderly and ignorant. *Madame* is shortened into madam, a usual term of address for ladies in general, but still also a word of honor, applicable, in particular cases, to majesty itself.

Dame aux Camélias, La, lä däm ō kä-mā-lē-ä (Fr. "The Lady of the Camellias"), a novel by Alexander Dumas the Younger, having for its heroine a certain real character, Margaret Gautier, belonging to the *demi-monde* of Paris. The novel appeared in 1848 and was published in dramatized form by Dumas in 1852. The English version of the play is known as 'Camille.'

Dameron, Charles Emile, shärl ā-mēl dā-mē-rôn, French painter: b. Paris 1848. He was a pupil of Pelouse; and has won several medals, one at the Centennial Exposition at Philadelphia, in 1876. His works include: 'Pyramids'; 'Oaks of Grand Moulin'; 'Woodman's Cabin in the Autumn'; 'Valley of the Mantega'; 'Approaching Storm.'

Dames of the Revolution, an American society organized in 1896, and composed of women above the age of 18 years, of good moral character, and of proved descent from ancestors who, either as military, naval, or marine officers, or officials in the service of any one of the 13 original colonies or States, assisted in establishing American independence during the War of the Revolution, or between 19 April 1775, when the hostilities began, and 19 April 1783, when they ceased.

Dame's Violet (*Hesperis matronalis*), the only American representative of the genus *Hesperis*, of the natural order *Cruciferæ*, or mustard family. The genus belongs to Europe and Asia, and the American plants have escaped from cultivation. The pale purple sweet-scented flowers are found in fields and on roadsides in southern New England, westward to Kansas, and also in North Carolina. Other common names, mostly from England, where it is a very common flower, are: Queen's or dame's gillyflower; night-scented gillyflower; damask violet, etc. The flower is extremely cultivated, and garden varieties are found in all tints from purple to white.

Damiana, dä-mĭ-ä'nạ, a drug derived from the leaves of South America, Mexican and Central American species of *Turnera*, especially *Turnera diffusa*. The botanical relationships of the various species are not well known. The chemical components consist of volatile oil, resin, and bitter principles, and the drug, therefore, acts as the aromatic bitters. It is widely used in many disreputable quack remedies that are practically worthless.

Damiani, dä-mē-ä'nē, or **Damianus, Petrus, Saint, one of the fathers of the Church:** b. Ravenna 1007; d. Fuenza 23 Feb. 1072. In infancy he was abandoned by his mother and then treated inhumanly by one of his brothers who gave him shelter, but another brother, Damianus, undertook his guardianship and gave him a good education. In gratitude, Petrus assumed the name Petrus Damiani, Damianus' Peter. For some years he conducted schools in Ravenna, but at the age of 30 joined a community of hermits and 1041 was elected to be their abbot. The renown of his piety, sanctity, and wisdom having spread widely, brought to his cell people high and low to entreat his prayers or his counsel, and popes and emperors did not disdain to solicit his advice. Made cardinal and bishop of Ostia, 1057, he prevailed on Benedict X., irregularly elected by the dominant faction of the Roman nobility, to resign 1058, and 1062 he induced the anti-Pope Honorius II. to forego his claims to the Roman see. He was an intensely zealous advocate of the reform of the Church and correction of the flagrant abuses which were widespread among the clergy in his time. In his manifesto, well styled by him 'Liber Gomorrhinus' (Book of Gomorrha), he exposes without regard to the dignities held by the offenders, the vices and the unspeakable enormities by which they brought discredit on the Christian profession. Had not the interests of religion de-

manded it, such outspokenness would have been inexcusable and an offense against public morality. Another of his works bears the title, 'De Correctione Episcopi et Papæ' (of correcting a bishop and a Pope). All his life he practised the utmost austerities of the hermit. By decree of Pope Leo XII. his name was added to the roll of Doctors of the Church, and 23 February was appointed as his feast-day.

Da'mianists, or Angelists, disciples of Damian, the monophysite patriarch of Alexandria, in the 6th century. They professed a belief in only one nature in Christ. The Council of Chalcedon, in the 5th century, had condemned the heresy held by the Damianists in the 6th century.

Damien, dä-mē-ăn, **Father** (JOSEPH DAMIEN DE VEUSTER), a Belgian priest; b. Louvain 3 Jan. 1840; d. Molokai 10 Aug. 1889. At an early age he decided to become a priest, and in time he found work in his chosen mission field in Honolulu. Here he heard from the bishop the neglected state of the lepers, some 700 or 800 in number, who lived on the small island of Molokai, and he volunteered to live and work among them. From 1877 onward he became physician of their souls and bodies, their magistrate, teacher, carpenter, gardener, cook, and even gravedigger at need. For a long time he worked on single-handed at his noble labors, but was finally joined by another priest. For 12 years he escaped all contagion of the fatal disease, though in constant contact with the sick and dying; but in 1885 the malady appeared in him. He continued unabated his heroic labors till very near his death. Consult: C. W. Stoddard, 'South Sea Idyls'; 'Lepers of Molokai.'

Damiens, Robert François, rō-bār frăñ-swă dä-mē-ăñ, French fanatic: b. Tieuloy, Artois, 1715; d. Paris 28 March 1757. He enlisted as a soldier, and was afterward a servant in the college of the Jesuits at Paris, but in 1738 left this service in order to marry. He then served in different houses of the capital, robbed one of his masters, a Russian, and saved himself by flight. His mind was disordered when he returned to Paris at the end of 1756. In the beginning of the next year he went to Versailles, took opium for two or three days, and prepared for the crime which he attempted 5 January. As Louis XV. was on the point of getting into his carriage Damiens stabbed him in the right side. The wound was of a trifling nature. Damiens did not attempt to escape. When questioned he said he never intended to kill the king, which he might easily have done. The most cruel tortures he bore with resolution, and could not be induced to confess that he had any accomplices. He asserted that he should not have committed the act had he been bled, as he requested, and that he thought it meritorious. He was condemned to be torn in quarters by horses, and the sentence was executed on the Place de Grève at Paris.

Damietta, dăm-ī-ĕt'tă, Egypt, town in Lower Egypt, on one of the principal branches of the Nile, 100 miles north-northeast of Cairo; lat. 31° 25′ N.; lon. 31° 5′ E. It is irregularly built, and contains some fine mosques, bazaars, and marble baths. Damietta was at one time a very important place, and carried on an extensive foreign trade, but is now eclipsed by Alexandria. A bar at the mouth of the Nile prevents large vessels from reaching the town, compelling them to anchor outside, and to load and unload by means of small craft of from 30 to 60 tons burden. A military school and cotton-factory were established here by Mehemet Ali. The ancient town of Damietta (*Tamiáthis*) stood about five miles nearer the sea, or farther north. The danger to which it was exposed, however, from its position on the shores, induced the Egyptian caliphs to change its position, and to remove it to where the modern town now stands about the year 1251. The present town contains many antique columns and blocks, supposed to have been brought from the old city. It is the terminus of a railway from Cairo. Pop. 31,288.

Dammar, dăm'mar, a resin derived from various plants, principally *Agathis dammara* and *A. australis,* both members of the pine family. These are natives of Molucca and the East India Islands, also of the Philippines and New Zealand. Dammar is exuded from the main stems and also from the roots of the plants. In some regions, notably in the mountains of Sumatra, the resin bursts forth in profusion from spontaneous fissures. In other regions artificial incisions are made in the trees, with a yield of resin correspondingly greater. Dammar comes into the market in large masses, or small pieces. It is yellowish, transparent when in small pieces, smooth and brittle, breaking with a clean, glassy fracture and it is readily reduced to powder. It is intermediate in hardness between colophonium and copal. Chemically it contains traces of ethereal oil, dammarolic acid and two resins. It is widely used in pharmacy and in the manufacture of varnishes.

The same name is applied in commerce to the resin of other and unrelated trees. Thus the dammar of shipyards is obtained from a species of *Canarium,* an amyridaceous tree, while black dammar is a kind of pitch derived from the allied *Marignia. Shorea robusta,* a dipteraceous tree, yields pitch and resin used in Indian dockyards, and sometimes also called dammar. Dammar is also occasionally confused with kinds of copal; thus, the resin of *Vateria indica* (*Dipteraceæ*) is sometimes known as dammar or piny dammar, of which the piny varnish of India is compounded. One of the Australian species, *A. robusta,* has been grown in some parts of California with fair success.

Dammara. A genus of coniferous trees now known as *Agathis.* See KAURI.

Dammood', a river in British India, which rises in the district of Ramghur and flows through Bengal, east, southeast, and south a distance of 350 miles. Rich deposits of coal and iron are found in its valley.

Dam'ocles, a native of Syracuse, and one of the courtiers and flatterers of the tyrant Dionysius the Elder. His name has become proverbial in consequence of a well-known anecdote related of him as illustrative of the uncertainty of human greatness and felicity. He had been extolling the grandeur and happiness of Dionysius, whereupon the latter invited him to a magnificent banquet, where he would be regaled with regal fare and royal honors. In the midst of the entertainment, however, Damocles happened to look upward, and perceived a naked sword suspended over his head by a single hair. The sight of this filled him with dismay, and

taught him at what a sacrifice of mental peace and personal security the enjoyments and splendors of royalty may be purchased.

Dámodar, da-mō'dar, a river of Bengal, in India, which after a southeast course, flows into the Hugh, just above the James and Mary Sands and below Calcutta. A little below the mouth of its chief tributary, the Barákhar, which it receives from the north, the Dámodar becomes navigable. The valleys of these two streams contain the coal fields which produce about four fifths of the whole amount of coal mined in British India. Length about 350 miles.

Da'mon and Phin'tias (not PYTHIAS), two illustrious Syracusans, celebrated as models of constant friendship. Phintias had been unjustly condemned to death by Dionysius the Younger, tyrant of Sicily, but obtained permission to arrange his affairs in a neighboring place on condition that his friend should remain as a pledge of his return. Damon surrendered himself at the prison, ready to suffer death instead of Phintias if he did not return at a fixed time. Unexpected impediments detained him. Damon, still fully convinced of the faithfulness of his friend, was on the way to the place of execution, and the people began to murmur and to pity his credulity, when Phintias suddenly rushed through the crowd into the arms of his friend. While they demand each to die for the other, Dionysius himself approaches, pardons them, and entreats them to admit him a third in their friendship. Schiller has described this adventure in an excellent ballad, 'Die Burgschaft,' and it is the subject of a popular English tragedy.

Damper, a plate in an air-draft or flue, for the purpose of controlling the fire by regulating the area of the passage for the ingress or egress of air as the case may be. Dampers are of various forms. They are to the air-pipe or flue what the valve or faucet is to the duct for steam or liquids. The dampers of furnaces are either in the door of the ash-pit, to regulate the ingress of air, or in the course of or on top of the chimney, to close the egress of the volatile results of combustion. In the latter form they are used in almost all metallurgic furnaces.

In locomotive engines, a kind of iron venetian-blind, fixed to the smoke-box end of the boiler in front of the tubes; it is shut down when the engine is standing, and thus stops the draught and economizes fuel, but it is opened when the engine is running.

In pianofortes, certain movable parts, which are so arranged as to press upon the wires and check their vibration whenever the finger leaves the keyboard. Perfect damping is difficult to obtain, but when efficient it enhances brilliance of execution and distinctness of harmony in a composition.

Dampier, dăm'pēr, **William**, English navigator: b. East Coker, Somerset, June 1652; d. London March 1715. In 1673 he served in the Dutch war, and subsequently engaged in a band of privateers, as they called themselves, although in reality pirates, with whom he roved on the Peruvian coasts. Dampier, wishing to obtain some knowledge of the northern coast of Mexico, joined the crew of a Capt. Swan, who cruised in the hopes of meeting the annual royal Manila ship, which, however, escaped them. Swan and Dampier were resolved to steer for the East Indies, and they accordingly crossed the Pacific, and after various adventures Dampier and others were left ashore on Nicobar Island. After making several trading voyages in the Eastern seas he entered as a gunner in the fort at Bencoolen. Upon this coast he remained until 1691, when he found means to return home. In 1697 he published an account of his voyage round the world, which had a great success, and was supplemented by a second volume in 1699. He now obtained command of a ship in the king's service fitted out for a voyage of discovery. In this he made important explorations on the coasts of Australia and New Guinea. Dampier's writings include: 'A Voyage Round the World' (1697); 'A Discourse of Winds' (1699); 'Vindication of the Voyage to the South Sea' (1707); 'Voyages to the Bay of Campeachy' (1729). They bear all the marks of fidelity; and the nautical remarks display much professional and even philosophical knowledge. His observations on natural objects are also extremely clear and particular.

Dampier, the name of several places in Australasia: (1) Dampier Archipelago, a cluster of about 20 small rocky islands off the northwest coast of Australia, in lat. 21° S., and lon. 117° E., divided by the Mermaid Strait in two groups; in the east is Rosemary, the largest island. (2) Dampier Island, off the northeast coast of New Guinea, with a volcano about 5,250 feet high. (3) Dampier's Land, a peninsula of western Australia, fertile and well watered, lying between King Sound and the Indian Ocean. (4) Dampier Strait, between New Guinea and the archipelago of New Britain, forming, with Goschen Strait to the southeast, the shortest route from eastern Australia to China by some 300 miles. (5) Dampier Strait, separating the island of Waigiu from the northwest extremity of New Guinea, the safest and easiest passage between the Indian and Pacific oceans.

Damping-off, the rotting of seedlings and cuttings in the seed-bed and the cutting bench, usually just above the surface of the soil. The immediate cause is a soil fungus (*Artotragus* or *Pythium debaryanum*) which feeds upon decaying organic matter until it obtains a favorable opportunity for attacking a living host. This opportunity is generally afforded by a weakened condition of the seedlings or cuttings due to a more or less stagnated atmosphere highly charged with moisture and of rather high temperature. The fungus gains entrance to the weakened stems which soon turn brown or black. The foliage quickly becomes infested and sometimes in a single night a whole seed-bed or bench full of cuttings may become a rotting mass with no healthy plants left. With careful management the trouble can be avoided. The propagating medium should be clean, sharp sand, which should be thoroughly drenched when the bed is watered, the excess water passing quickly away in perfect drainage. The bed should never be allowed to become dry. In short, both seedlings and cuttings should be kept growing steadily and sturdily. The drenching washes the spores of the fungus down through the sand. Should a bed become infested the healthy plants should at once be transferred singly and with as little soil as possible to fresh quarters. Neither freezing nor drying

the soil will kill the fungus, which can live for months when growth is impossible. Sterilizing the sand or soil with steam is sometimes resorted to, the sand being heated for several hours. Less frequently plants in the open air are attacked. In the greenhouse and nursery experience in management will count for much.

Damps, certain deleterious gases which are released in mines. They are distinguished by miners under the names of choke-damp and fire-damp. The former is found in the deepest parts of mines. It extinguishes candles, and often proves fatal to human life. It consists for the most part of carbonic acid gas. The fire-damp, which prevails almost exclusively in coal-mines, is a mixture of light carburetted hydrogen and atmospheric air, and explodes violently whenever it comes in contact with flame. The gas or after-damp which remains in a mine after an explosion is a kind of choke-damp, and consists of a mixture of carbonic acid gas — produced by the combustion of the carburetted hydrogen — and the nitrogen of the air. It is of course fatal. The accidents which formerly occurred so frequently both to the machinery and to miners, arising from the fire-damp, are, if due precaution is used, obviated by Sir Humphry Davy's safety-lamp. This lamp consists of a cylinder of wire gauze, about four inches in diameter and one foot in length, having a double top, securely fastened by doubling over to a brass rim, which screws on to the lamp itself below. The whole of the wire gauze is protected and rendered convenient for carrying by a triangular wire frame and a ring at the top. The wire gauze is made either of iron or copper, the wire being at least one thirtieth of an inch in diameter, and woven together so as to leave 625 apertures in a square inch. The body of the lamp is of riveted copper, or of massy cast brass or cast iron, the screws fitting so completely as to leave no aperture into the body of the lamp. When the lamp is lighted, it affords the miner all the light which he requires, and renders him perfectly secure, even though entirely enveloped with the gaseous mixture which, with an ordinary light, would immediately explode. The first effect of the fire-damp atmosphere is to increase the length and size of the flame. When the carburetted hydrogen forms as much as one twelfth of the volume of the air, the gauze cylinder becomes filled with a feeble blue flame, but the flame of the wick appears burning brightly within the blue flame, and the light of the wick expands until the inflammable gas increases to one sixth or one fifth, when it is lost in the flame of the fire-damp, which now fills the cylinder with a pretty strong light. As long as this explosive mixture of gas exists in contact with the lamp, so long it will give light; and when it is extinguished, which happens when the foul air constitutes as much as one third of the volume of the atmosphere, the air is no longer fit for respiration; for though animal life will continue when flame is extinguished, yet it is always with suffering. A coil of platinum wire being fixed above the wick of the lamp, within the gauze cylinder, the metal continues to glow long after the lamp is extinguished, and affords a sufficient light to enable the miner to make his escape. The effect of the safety lamp is supposed to depend on the cooling agency of the wire gauze, exerted on the portion of gas burning within the cylinder. Hence a lamp may be secure where there is no current of an explosive mixture to occasion its being strongly heated, and yet not safe when the current passes through it with great rapidity. But any atmosphere, however explosive, may be rendered harmless by increasing the cooling surface, which may be done either by diminishing the size of the apertures, or by increasing their depth, both of which are perfectly within the power of the manufacturer of the wire gauze.

Damrosch, däm'rŏsh, **Frank,** American musician: b. Breslau, Prussia, 22 June 1859. He was trained by his father, Leopold (q.v.), and in 1882 became conductor of the Denver Chorus Club and supervisor of music in the public schools of that city. He was chorus master at the Metropolitan Opera House, New York, from 1885 to 1891, and in 1892 organized the People's Singing Class. Since 1897 he has been supervisor of music in the public schools of New York.

Damrosch, Leopold, German musician: b. Posen, Prussia, 22 Oct. 1832; d. New York 15 Feb. 1885. He was graduated from the University of Berlin, and began the practice of medicine; but his love for music predominated, and in 1864 he gave up his medical profession and started on a tour as violinist. He met with great success and on his return to Posen was appointed musical director at the Stadt Theater. He subsequently held a similar post in Breslau. Coming to the United States, he was made leader of the Arion Society in New York, and subsequently founded the Oratorio and Symphony societies of that city.

Damrosch, Walter Johannes, American musician: b. Breslau, Prussia, 30 Jan. 1862. He is a son of Leopold Damrosch (q.v.), and has been a citizen of the United States since 1871. He inherited the musical talent of his father, and succeeded him in his enterprises. He is the special exponent of the Wagnerian school of music, and has conducted operatic performances in all the large cities, proving himself a most acceptable leader. He has also written an opera founded on Hawthorne's tale of 'The Scarlet Letter,' besides other excellent music.

Dams. To dam (originally, to stop up) is to obstruct or restrain the flow of a liquid. In engineering, a dam is a barrier to constrain or keep back a flow of water. Dams vary in structure as widely as the physical character of their sites, the purpose for which constructed, and the materials used. Every dam is, in a sense, a special adaptation, and may be referred to some more or less varying type.

The art of dam building is coeval with civilization when the stream from the mountains, spending itself in the arid plain, was diverted for irrigation. The gardens and the water-wheels of Damascus are back of history. The Nile valley, the Euphrates-Tigris plain, the Oxus and Jaxartes, and much of India, developed civilization in the application of the waters to the land, and this will be the history of their restoration. It was a time of mighty endeavor in hydraulic engineering, little understood in humid lands, demanding a high social organization and a closely knit state. Cyrus turned the Euphrates from Babylon and an em-

ture fall and rise. Lake Moeris regulated the floods of the Nile in the days of Joseph, and its operation is credited with the seven fat and the seven lean years by some antiquarians; and Bahr Jussuf (meaning, the water carrier) still leads to the Fayum basin. Modern Egypt has built the barrage across the Rosetta and Damietta mouths of the Nile for the continuous irrigation of the delta, and the dam at Assouam puts under servitude more than 6,000,000 acres of new lands, nearly doubling Egypt.

The old Hindu anicut turned the flow of formidable rivers into irrigation canals, and as a rock-fill with long paved slope and an apron down stream, it serves the engineers of India to-day. The ancient tanks of India are natural depressions closed by a bank of earth, sometimes of great height and miles in length, formed probably by basket carriage and consolidated by tramping.

The protection of lands against flood by embankments, levees, or dykes, belongs to primitive times. Along the Yellow River ("China's Sorrow") the Chinese built levees in double line with cross-banks, so that the failure of the front line at any point by undercutting or other cause, would only inundate the check immediately behind. The Po and Adige of northern Italy were embanked in remote times and the history of these works is of great interest.

Taking counsel from the beaver the basket-work dam of moderate height on alluvial streams was long since devised, and from this has evolved the modern bank protection of braided willow mattress in use on Western rivers. The primitive neighborhood grinding-mill led the head-race up-stream to a dam of simple type.

The utilities widen in approaching the modern era. The stream flow of the growing season no longer suffices for the needs of irrigation and the surplus is impounded for larger areas and the time of need. The uncertain navigation of streams no longer satisfies commerce, and canal systems follow with extensive storage and feed-water developments, and this again, with steam navigation, gives away to the direct improvement and the canalization of river beds by means of fixed and movable dams. Growing cities need water supplies, a demand now universal, and often extraordinary structures are required. Industries develop with the water-power, the turbine makes higher heads available and changes the problem of dam construction for power purposes; and finally comes the electric generator and distant transmission with further demands.

The United States contains enough water power capable of development to turn every wheel and do the heating and cooking for all the people that can live on the land, and next to the land the waters are the most valuable economic asset. The future may well see an era of dam and reservoir building, in the humid as well as in the arid regions, for the better equalization of the flow of streams, in the interest of navigation, the alluvial lands and of water power and for the development of fisheries. The acre of water may be made as valuable as the acre of land.

Embankments.— Embankments for restraining water are widely applied and have special names: as levees and dykes for protecting lands, banks forming canal prisms, coffer-dams, reservoir embankments, and the embankment with spillway adjunct for impounding water, the latter being called a dam.

The levee is built of the alluvium of river bottoms to restrain flood overflows. It is given sufficient freeboard above the greatest known flood, the top width is usually greater than the height and the side slopes are very flat, sometimes as low as 5 or 6 to 1. The site is cleared of all humus and other vegetable matter and well broken, so as to bond the embankment to the natural ground, and all such material is excluded in forming the embankment. A "muck-ditch" is made when deemed necessary, and "buck-shot" or other water-tight material is puddled in and carried up into the embankment as a core.

Many hundred miles of levees have been built along the Mississippi River and its tributaries, some of them of very large proportions. When built according to the best practice, well-seasoned and turfed over, failures are very rare, though floods often stand against them for weeks and the material is comparatively mobile when saturated. Failures have been due to insufficient height and the chopping effect of waves, but especially to lack of maintenance and of care at critical periods. The craw-fish burrowed through at the turf line when its removal was omitted, and board fences were built in the levee to intercept this pest, but they decayed and weakened the levee and are now omitted, and less is heard of the craw-fish with the better practice of later years. In northern latitudes the muskrat has also been a nuisance, as in the embankments of the reservoir system at the head-waters of the Mississippi River built for the purpose of increasing the low water flow.

Canal prisms frequently skirt the sides of valleys or contour slopes, partially in excavation with part or full bank on lower side. The material for forming banks is generally far superior to that available for levee construction. The slopes are usually flat, from 2 to 3 on 1, and a water-tight core or face is added in permeable ground, or the entire prism may be given a puddle lining when the percolation is liable to be serious. Sheet piling has been driven in such banks, but this divides the bank and is not now considered good practice. The unwatering of navigable canals in the winter time is also bad practice, as it subjects the inner face to frost action.

Canals are carried across water courses and valleys on supporting embankments, sometimes of great magnitude. Such embankments are given easy slopes and care exercised in forming a water-tight prism above, so as to avoid saturation and the resulting instability.

Ditches for irrigation and hydraulic mining sometimes reach the dignity of large canals, requiring care in the formation of banks. The soil of their location is usually of fine tilth with an admixture of adobe, and such channels generally "seal" quickly with the fine sediment carried in the flowing water of certain seasons.

The embankment used as a coffer-dam, usually encloses some large site, as for the construction of a canal lock or for rock excavation in the dry, and is of a temporary character. Suitable material may be dumped from a trestle, the mass of material formed in water by dumping from a height being usually sufficient. In a notable case, a recent contract for a rock channel in the St. Marys River, a heavy em-

bankment more than a mile long was formed of dredged material to a maximum height of 30 feet, and rock, estimated as wet excavation, was taken out in the dry at a large profit. No great care was taken in this embankment, except to provide suitable material and sufficient mass.

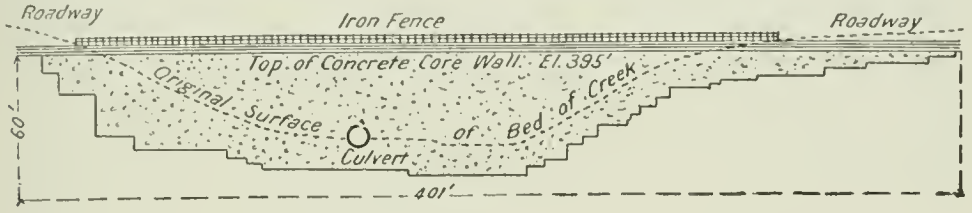
The reservoir embankment proper is usually for a storage or distributing reservoir, as for a municipal water supply. Such reservoirs are from 20 to 30 feet deep and the embankments are formed with great care from selected material placed in thin layers, watered and rolled. The inner face is lined and protected by a face-wall, a pavement of brick, stone pitching, or even rip-rap in some large storage reservoirs. The height of the embankment varies with the supporting ground.

The impounding embankment, or earth-dam, is usually carried across some drainage line between steep valley slopes, so as to make a reservoir in the valley expanses above, and generally seeks to store a large proportion of the run-off. An ample spillway on an independent site is provided to carry the extreme flow of the valley when the reservoir is full.

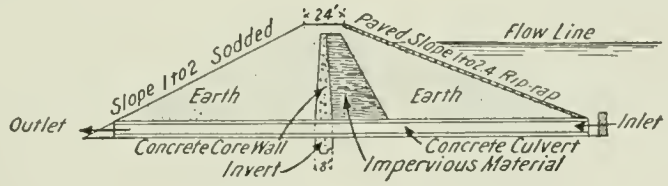
Such embankments are usually made of selected material compacted in layers and provided with a core wall of puddle or masonry reaching down to impermeable strata, and the jet and flume, and the heights are given above natural surface and above the foundation.

Earth-dams have failed by over-topping from insufficient spillways or deficient freeboard, from saturation and sloughing of the rear slopes, and from cutting out around pipes carried through the base. Embankments subject to water action should have slopes much in excess of the so-called "natural" or dry slope. The dividing of a bank vertically by a core, with unequal settlement and the upper half subject to saturation, is to be avoided. Present practice tends to an impermeable up-stream face and upper toe wall or intercept to a safe depth with good drainage behind, thus developing the full stability of the material. Pipe lines through made banks are to be avoided, and in any location great care is needed to prevent seepage along the pipe line.

The hydraulic-filled dam is probably a departure in the right direction. Recent attention has been given to dams of large section, filled by water carriage or by dumping from a height, the finer material up-stream, and having very flat slopes. Such a dam is in reality a mound, and can be made of a wide variety of material, the stability depending upon a moderate ground-water plane through the body of the fill rather than on impermeability. Such plane should not be sufficient to produce springs that will disturb



LONGITUDINAL SECTION



TRANSVERSE SECTION

Earth Dam with Concrete Core Wall. Tomhannock Dam; Water Supply of Troy, N. Y

side slopes are made easy and pitched with stone, up-stream, or otherwise defended.

The general limit of height is 60 to 100 feet, though higher dams have been built. The following table gives a few examples:

Location	Height	Length	Core
Waverly, N. Y.	60	322	Masonry
Amsterdam, N. Y.	65	410	Masonry
Middle Branch, N. Y.	73	740	Masonry
Druid Lake, Baltimore	119		Puddle
Tabraud, Jackson, Cal.	110–120		None
San Leandro, Oakland, Cal.	125–158	300	None

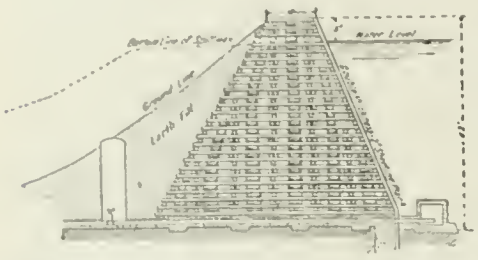
The two last mentioned are hydraulic-fills, suitable material being run in by means of water the material, and the fill can be tightened or "sealed" by means of roily water or mud against the up-stream face.

Timber Dams.— The timber dam across flowing streams for power purposes was well nigh universal in the pioneer development of the country. Timber was plentiful and its uses widely familiar. Wooden wheels with horizontal axes utilized moderate heads, and these were also limited by the height of banks, so as to avoid excessive flowage with sufficient pond so that the flow of the dry season could be used in the daylight hours.

Such dams were usually built for heads of 6 to 16 feet, though the Connecticut River dam at Holyoke had a height of 30 feet. Better heads were often produced by a dam at the

head of some rapid, with a race leading down-stream.

Timber dams were built in a great variety of forms, much depending on the character of the site and the material available. A common type was the crib or "cob-work" structure with the pockets filled with stone, having a broad base, sheeted up-stream, and banked with earth, the spillway and apron dropping in steps down stream. Piling was sometimes driven, capped and sheeted to an apex like the roof of a house,



Cross-section: Crib Dam, Basin Creek, Montana.

the spaces between piling being filled with stone and the up-stream toe banked with earth. Frame dams were also built, a sheeting of timber being supported by triangular frames resting on mudsills; the up-stream slope was flat, usually 2 to 1, the dam being held in place by the weight of the water, the toe being covered by a bank of earth. Log dams were cribbed up and sheeted up-stream like frame-dams; and dams were built of piling and sheeting alone, driven into the river bed.

Timber dams have lasted well where the height has not been excessive, the upper parts have been easily renewed when decayed or worn out, and they have been exempt from wholesale failure with disastrous results. They will always be used in timber regions for manufacturing lumber and with sluiceways for driving logs. No material equals timber in resisting water shock and vibration, and its use will be preferred by many. Under water timber is everlasting, and it will always be a useful material to the hydraulic engineer.

A large proportion of the small powers have been abandoned, and with the development of the turbine higher heads have been sought. The electric generator and transmission has greatly enlarged the water-power field, and this has accentuated the tendency toward higher dams and larger units. In recent years portland cement has become cheap and reliable, and timber less available, and concrete dams with higher heads are coming into use.

Masonry Dams.— Many timber dams have been rebuilt in masonry, including the great dam at Holyoke before referred to. Modern practice combines a number of turbines on a horizontal shaft connected direct to the electric generator, and this demands that the floor of the fore-bay and of the generator room shall be above the back-water of floods, and that the turbines discharge into the tail-bay through draft-tubes. The exacting demands of electrical service require uninterrupted power, or that the head shall be sufficient to give effective results in flood time. These conditions have increased the height of dams to about twice the flood range, with low water heads of 20 to 40 feet. Some over-fall dams have, however, been carried up to 60 feet.

The approved form for an over-fall dam is a roll-way — a curved crest with a reverse curve extending down-stream as an apron to protect the bottom. The crest and upper slant should be worked out as a gravity curve for the maximum flood, thus avoiding the tendency of the nappe to lift, which has been credited as the source of tremor and vibration. The flash-board is a common error, and failure to remove these in floods has shaken off the tops of dams, in one concrete dam for one third the height.

A high and well-formed roll way dam may be called a speed-generator, and in high-water the horse-power turned into velocity is tremendous; and this is not dissipated by internal work for some distance down-stream. The beds and banks must therefore be defended, and naturally rock sites are sought. These are not always safe, as shown in the failure of the 60-foot dam at Austin, Texas, where the down-stream toe was undermined by reason of the omission of proper defense.

For sites without rock bottom in reach, great care is necessary in defending the channel below from erosion. For such sites the "tumble-bay" dam is best adapted, in which the force of the falling water is dissipated within the confines of the structure. In dams of this type, the sheet of water is given a sheer fall, being well ventilated behind, into the pool or bay which has a depth of ½ to ⅔ the height of the fall, and the water escapes from the bay over a breast wall or roll-way with little or no destructive energy. Some recent designs show a A shaped plan of dam with a triangular tumble-bay closed by a low roll-way, with a bridge of reinforced concrete spanning the roll-way between piers. The bottom of the bay is a heavy bed of concrete defended by a timber floor beneath the sheet of falling water. The proposed dam on rock across the Mississippi River opposite Keokuk, at the foot of the Des Moines Rapids, for a head of 30 to 35 feet, is to be made up of a line of such bays.

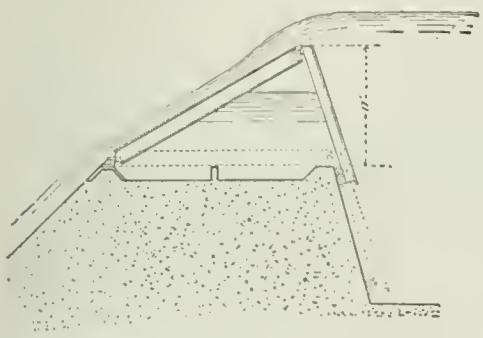
High dams without rock foundations will, in many situations, require foundations of bearing piles and a liberal use of sheet piling. The structure has naturally a broad base which is an element of security. Further security may be had by sealing the river bed for some distance up-stream, depending upon its character and the head. Nature will perform this service in time, if a blow-out does not meantime occur, as streams generally carry sediment at some season. The facility with which a water-course can seal itself against a gallery alongside or beneath has amazed some waterworks engineers.

The problem in such foundations is one of percolation around and beneath. The history of the barrage across the two outlets of the Nile, near the head of the delta, is instructive in this connection. A masonry structure was built upon strata of the most mobile character, and has been put in successful operation by sealing the bed up-stream with impermeable material for a distance of 20 times the head on the dam. This experience should assure the possibility of founding a dam on any site.

Movable Dams — In the improvement and canalization of rivers the dams are usually of moderate height, and when of the ordinary type are called "fixed" dams. The purpose of canal

ization is to maintain the ordinary pool level as high as the adjacent lands will permit without interfering unduly with the flood regimen, and for this end several types of movable dams have been devised. These are much used abroad and a great development is to be expected in this country.

One of these types is the bear-trap first used on the Lehigh navigation of Pennsylvania early



Bear-trap Dam. Water-power Plant, Chicago Drainage Canal, Lockport, Ill.

in the last century. This consisted of a timber platform at or near the level of the stream-bed, with two leaves overlapping and hinged near the up and down stream edges. By introducing water beneath through a regulating sluice these leaves rise with the head of water above until they reach the proper height in the form of a flat A dam. The use of these dams for navigation seems to have disappeared for a time, but continued in the lumber regions as a device for holding a pool of water for storing logs and then flushing the same down the stream. As thus used the bear-trap has been variously altered and made as long as 60 feet, beyond which trouble has occurred from the warping or twisting of the leaves. Various designs have been proposed for waterway purposes. The most notable application is the bear-trap, 160 feet long, installed at Lockport as a part of the "controlling works" of the Chicago Drainage Canal. This is made of metal, is hinged at the top-angle, the upper-leaf dropping in front of a breast-wall. It has a range of 15 feet and is so counter-weighted and controlled that the depth flowing over is practically uniform at any elevation, and it is easily maneuvered by one man.

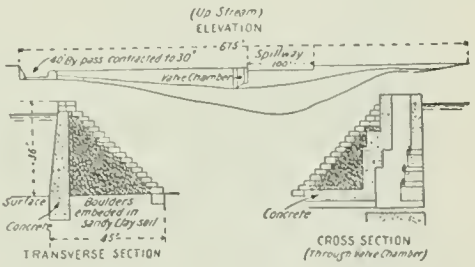
A second type is an evolution from the old "stop-plank" used in mill practice, set vertically or horizontally. The "needle" is a piece of light wood, rectangular, and shaped into a handle at top. These are placed in juxtaposition against a sill on the floor of the pass or on the weir and against a girder above water level. This arrangement is called a "needle-dam." The needles are usually designed for one man to handle, and their application is thus limited to control through a moderate range. It is properly an auxiliary in some other type of movable dam for the purpose of regulating pool level in moderate flows of water. A needle-dam has been built, however, on the Big Sandy River in which large needles are handled by derrick. The horizontal stop-plank has been hinged into a curtain which is unrolled against supports, thus closing the pass.

The shutter or wicket-dam is thus far the favorite for river work. This consists of shutters several feet in width and of the length desired, the lower edge resting against a sill and supported by a prop behind, the shutter tipping automatically and falling to the river-bed when the depth over top exceeds a certain limit. The shutters are raised by means of a windlass from a service bridge or boat. This type of dam is used on the Ohio and Great Kanawha rivers. Shutters are also hinged at the sill and the props released mechanically, and they have been mounted on pivots between supports like flutter-gates.

A dam has been recently built in Germany and covered with an iron cylinder several feet in diameter, which is rolled away in flood time. The Taintor gate has been much used for closing passes and chutes and has been built in sections 20 feet long and for a depth of 10 to 12 feet. This is a sector of a cylinder against the water, the centre of motion and support being below the centre of figure, so that the water pressure shall nearly balance the weight and assist in raising the gate. Some dams have been built for power purposes in which the flood flow is practically controlled by Taintor gates. This practice is not to be commended, for both gates and men sometimes fail to act.

The movable dam is still in the stages of evolution, and there will be many devices before practice is settled.

Rock-fill Dams.— Hydraulic mining on the Pacific slope developed the rock-fill dam, and it has been utilized for irrigation works. Originally this dam consisted of a dump of loose rock in a cañon or other rock-bound site, taking its natural slope down-stream, the upper slope being hand-laid and steeper and faced with red-wood



Castlewood Rock-fill Dam, Denver Land and Water Co.

or other planking and caulked. Later a sheet of metal was substituted for the planking, and the construction was varied by setting the metal sheet vertically in the heart of the dam. The metal sheet was coated and sometimes enclosed in asphaltum concrete. Such dams had an independent spillway.

These dams have been carried to considerable heights, several exceeding 100 feet, the highest being the Lower Otay, near San Diego, Cal., 161 feet above rock and 130 feet above natural surface. Settlement has occurred in most of these dams, causing apprehension, but no serious disaster has occurred.

A dam of this character was undertaken in Goose-neck cañon on the South Fork of the South Platte, some 50 miles southwesterly from Denver. In order to avoid settlement, the rock was dropped into place from a height of about 100 feet, as experience in the spoil-banks of the

Chicago Drainage Canal had shown such consolidation from this cause that blasting was resorted to in opening up a roadway across same. The down-stream slope was to be flattened and the hand-laid stone up-stream was to be filled with lean concrete, and faced with a metal sheet. When this dam had reached a height of 50 to 60 feet it was overtopped by an unprecedented flood and washed away. The experiment was valuable in showing that a mound of granite rock thus consolidated was nearly water-tight, under a head of 50 feet of water. (The facing was not carried up.) This experience suggested that a filling of finer material gradating to adobe at the face would have made a successful structure without the intervention of wall or metal sheet. The site was later occupied by a high masonry dam.

Experience in this class of construction also suggests the flatter slope down-stream and the water-tight skin at the upper face, rather than a core or intercept in the heart of the dam. Dams which depend on a timber or metal sheet for tightness cannot be regarded as permanent structures, and a lack of care in maintenance invites destruction. They are, however, useful expedients in the early development of remote regions.

Metal Dams.—Metal dams are often proposed, and a few examples have been executed in steel. Steel is perhaps more perishable than timber, and its failure from growing weakness and lack of care is likely to be more complete and disastrous. It is adapted to much greater



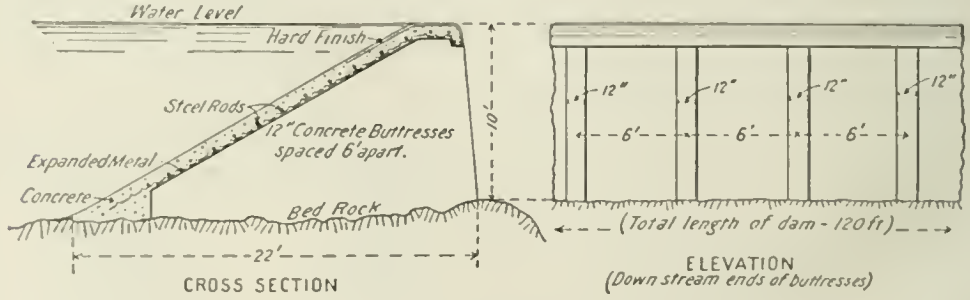
High Masonry Dam. Cross-section through the Wachusett Dam at the deepest part of the valley. Metropolitan Water Supply, Boston, Mass.

heights, but is to be regarded as an expedient for a few years until something better is justified.

Reinforced Concrete Dams.—Reinforced concrete is growing in favor for many purposes, and it adds an important resource to the art of engineering. It is valuable in flume and bay construction, and in many other features of hydraulic works, and a certain amount of reinforcement can be added near the crest of overfall dams and to avoid checking at critical points.

Designs of thin sections that do not depend on their mass for stability are not to be encouraged for the governing features in hydraulic works. In the present state of the art neither materials nor workmanship can be relied upon to give to concrete a definite quality as in metal. The tremor and vibration produced by falling water is a serious matter, and light sections are in the wrong direction and also in greater danger from sympathetic vibration. Dam construction should be in the direction of well-adjusted mass, solidity, and permanence. The consequences of failure are too enormous to make true economy in the saving of mere fractions of cost.

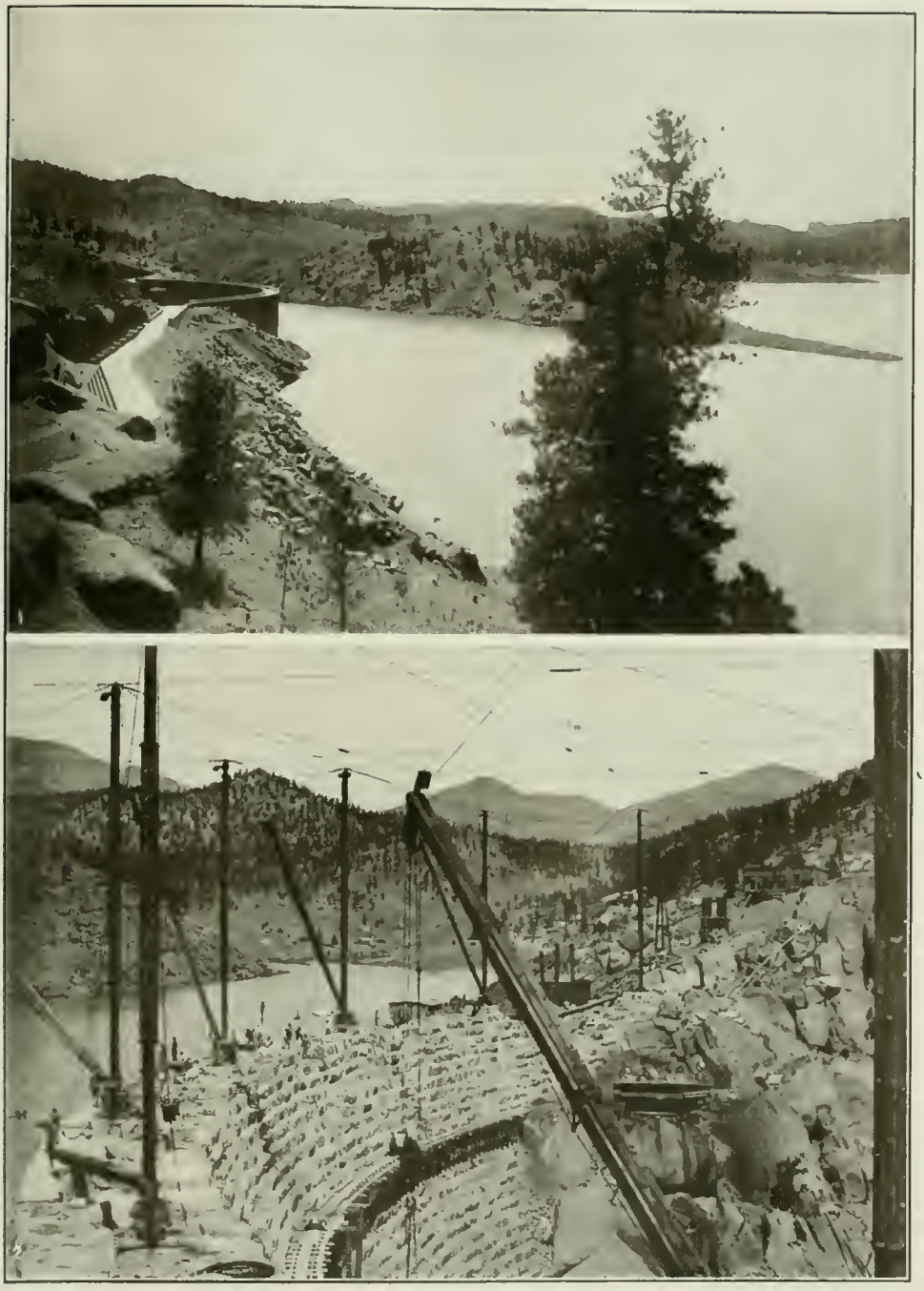
High Masonry Dams.—The high masonry dam is comparatively recent, originating in Spain some three centuries ago, but its rational design began with the Furens dam in France less than a half century ago. The examples are not yet numerous, but the better quality of masonry for hydraulic construction and the greatly reduced cost, together with the more enlightened demand for the conservation of water for irrigation, water-supply, water-power, navigation, and fisheries, combined with the greater security and permanence, promises an era of high masonry dams.



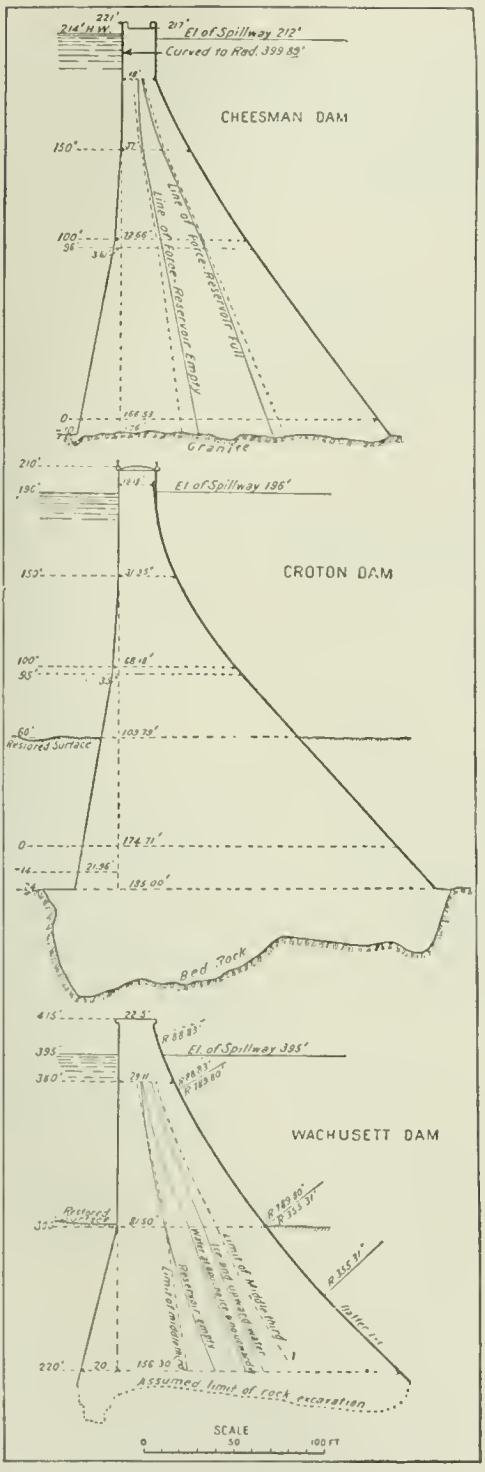
Concrete-steel Dam, Theresa, N. Y.

The approved cross-section has a thickness at top of 8 to 10 per cent of the height, a curved batter down-stream and a slightly curved batter up-stream, the conditions being that the locus of strain shall not pass outside the middle third, and that the greatest pressure in the masonry shall not exceed safe working limits, the latter being governed by the quality of the masonry. The construction is massive random rubble work with an avoidance of continuous beds and joints, the up-stream face in courses with roughly dressed beds and joints, the down-stream face of selected stone. The top of the dam is usually finished as a roadway with parapet walls, and the spillway is constructed on an independent location. The site is a rock gorge or cañon with a valley expanse above for the reservoir.

Three notable dams have been recently completed:



1. Cheesman Dam and Reservoir. (Depth of water in reservoir, 160 feet, October, 1904.).
2. Cheesman Dam (under construction in 1903).



Comparative Sections — High Masonry Dams.

The New Croton dam for the water supply of New York city is a straight dam, 291 feet high above the rock, 150 feet above the natural surface and 2,240 feet long on top, and it forms a reservoir with a capacity of 4,270,000,000 cubic feet.

The Wachusett dam for the Boston Metropolitan water supply is also a straight dam, 200 feet above the rock, 125 feet above the natural surface, and 1,500 feet long on top, and it forms a reservoir with a capacity of 8,400,000,000 cubic feet. The section is notable in the allowance made for ice pressure with a full reservoir.

The Cheesman dam for the water supply of Denver is located at Goose-neck Cañon on the South Fork of the South Platte, about 50 miles from Denver, and controls the run-off of some 1,800 square miles, including South Park. This dam is 225 feet above rock and 217 feet above the outlet tunnel and 700 feet long at top. It is built of granite quarried near the site, and produces a reservoir with a capacity of 3,500,000,000 cubic feet. The dam is curved in plan on a radius of 400 feet. The cross-section would be considered slender for a straight dam, but the masonry is of the highest quality and the arch form adds materially to the strength, probably 50 per cent or more. Such curvature also lessens the liability to temperature cracks. The spillway is an independent construction, located in the saddle of the "goose-neck." The water is drawn through tunnels fitted with valves at three levels, joining in a common outlet tunnel. The tunnels are driven through the "goose-neck" between the dam and spillway. The entire site is a granite formation.

The Cheesman dam is notable as carrying the greatest free head of water of any structure in the world. It was completed in the autumn of 1904, and water ran over the spillway on 9 May 1905. A considerably higher dam has been projected in Platte Cañon, below the junction of the two forks, and higher dams are also projected by the Land Reclamation Service.

A very remarkable masonry dam, depending almost wholly on the arch form, is the Bear Valley dam of California. This dam is 60 feet high, 450 long on a radius of 300 feet, and is only 20 feet thick at bottom and 3.17 feet thick at top. It was built in 1884 and still stands, notwithstanding its critics. Such extreme sacrifice of mass to the logic of the strain sheet is doubtful practice, in view of uncertainty in material and in the forces that may some time show up.

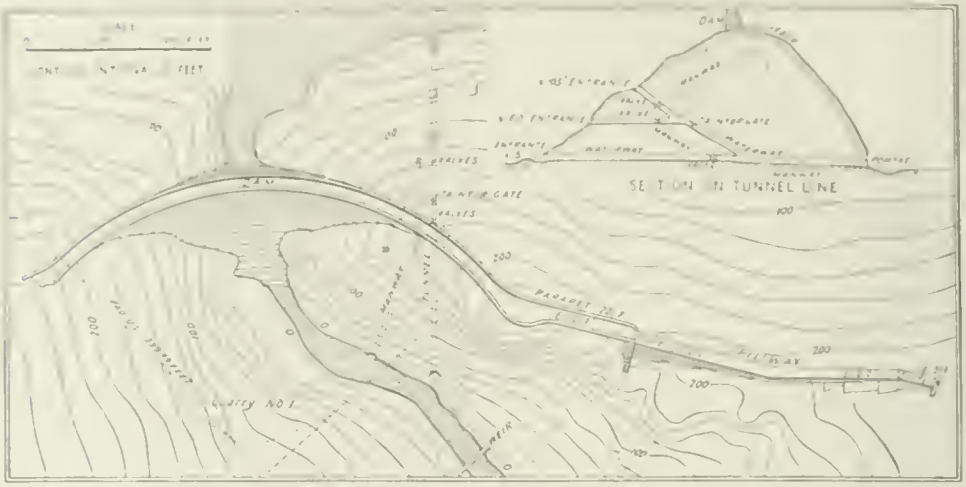
The use of concrete in the very heavy sections of high dams is still an open question on account of the absence of positive knowledge as to the continued setting of the concrete in the interior of large masses. Carrying the work up very slowly, or the leaving of numerous "swallow-holes" to be filled later, may obviate this objection. Otherwise the monolithic character of concrete work is a peculiar adaptation.

Adjuncts.— The ordinary dam across a stream is its own spillway. For impounding dams of earth or rock-fill the independent spillway is obvious. It should be equally obvious for the high masonry dam, and this is now recognized by the best practice. Many errors have been made, especially in arid regions, through insufficient spillway. In humid regions the "greatest flood" occurs two or three times in a century, and if these are provided for, the margin is usually sufficient for any contingency. In the arid regions a flood as great may be

but the occurrence is far more erratic. Cloudbursts produce startling effects in small basins, but the results in basins of considerable area are not significant.

The Yellow River of China has a large proportion of arid and semiarid territory, and four times in its history it has devastated its valley, notwithstanding all the defences of man, and changed its lower course to the sea. All the interoceanic canal. The treatment of the Nicaragua route was made to turn on the question of a site for a predetermined type of dam, while the plans for Panama are still undetermined, largely by reason of differences upon a similar question. Earthquake conditions in either region are also factors for consideration.

Bibliography.—Information more or less valuable may be obtained by consulting: Barsall,



Lake Cheesman Dam. Water Supply of Denver, Colorado.

factors in flood flow will sometime conjoin, and a work that is to last through the centuries must recognize all the possibilities.

Adjuncts in the way of gates, sluices, and movable structures are much favored by some designers, especially where they serve to lessen cost. Such provisions should not be carried to a point where their failure to operate or be operated will produce damages amounting to a disaster.

The location of service pipes and outlets through or beneath dams is shown by experience to be a source of danger, and the best practice now seeks an independent location.

The tendency is now to avoid the long race for power purposes, to build the dam at the foot rather than the head of the rapids or descent, and to make the power station and forebays a part of the structure, taking the water directly from the pool.

Outside of the main elements of a structure on which safety and permanency depend, many devices and constructions are permissible, as failure in these result in only temporary loss and inconvenience.

General Remarks.—Dam building is still in the evolutionary stage, and the resources of engineering therefor are still developing. The type structures would seem to be well defined, but every site has its own peculiar conditions, requiring elasticity in treatment, and financial limitations often blight the proper solution. A dam when once built assimilates so closely to natural resources, is so fully identified with the public welfare, and the failure is so disastrous, that its construction becomes a matter of solicitude above that of any other engineering work.

How important a knowledge of these matters may be is illustrated by the question of an

'Earth Dams' (New York 1900); Frizzell, 'Water-Power' (New York 1901); Fanning, Follwell, Goodell, and Turneure, 'Treatises on Water Works'; Schuyler, 'Reservoirs for Irrigation, Water-Power and Domestic Supply' (New York 1901); 'The Manual of American Water-Works'; Wilson, 'Manual of Irrigation Engineering' (New York 1897); Wegmann, 'Design and Construction of Dams' (New York 1899); also see articles on IRRIGATION; RESERVOIRS; WATER-WORKS, and WATER-POWER in this encyclopedia.

LYMAN E. COOLEY,
Consulting Engineer, Chicago.

Damsel-fly, sometimes, though rarely, used as a popular name for the common dragon-fly, or mosquito-hawk, of the neuropterous family *Libellulidæ*. Damsel-fly is the English equivalent for the French *demoiselle* (fly) which is applied only to the genus *Agrion*. This is a very small dragon-fly, not half as large as *Libellula*. Its metallic greenish-blue color and slender delicate form produce a beautiful effect in the sunshine, and suggest the name. See DRAGON-FLY.

Damson, a variety of plum (q.v.).

Dan (Heb. "judgment"), one of the sons of Jacob by his concubine Bilhah. Like the other sons of Jacob, Dan became head of one of the 12 tribes of Israel. At the time of the exodus the Danites numbered 62,700 adult males. The territory assigned them in Canaan lay on the coast, but living in the immediate neighborhood of the hardy and well-equipped Philistines — for the district lay partly within the Philistine territory — the available land proved somewhat too narrow for the Danites, and they were pushed back into the more mountainous region,

where they encroached on the boundaries of Judah. The tribe also possessed an isolated portion of territory in the extreme north of Canaan, containing the town of Laish or Dan, which gave rise to the proverbial expression "from Dan to Beersheba." This town was in later times selected by Jeroboam as one of the two centres of his idolatrous worship, but a species of idolatry had been maintained there from the earliest times of the settlement in connection with the image of Micah. The most notable person connected with the tribe was Samson.

Dan River, a river rising in Patrick County, Virginia, flows across the boundary between Virginia and North Carolina a number of times, but finally unites with the Staunton River, at Clarksville, Va., and forms the Roanoke. The river is somewhat less than 200 miles in length, and furnishes valuable water power in its upper part. It is navigable for about 100 miles above the junction with the Staunton River.

Dana, Charles Anderson, American journalist: b. Hinsdale, N. H., 8 Aug. 1819; d. Glen Cove, L. I., 17 Oct. 1897. He was educated at Harvard and in 1842 was a member of the Brook Farm Community, in Roxbury, Mass., remaining there only two years. He edited 'The Harbinger' (1844-7), his associates being George Ripley, Parke Godwin, and John S. Dwight. In 1847 he became managing editor of the New York *Tribune,* with which he remained until 1861. In 1855, with George Ripley, he projected and edited Appleton's 'American Encyclopædia' in 16 volumes, completed in 1863, and revised in 1873–7. He also edited several other works, among them the popular 'Household Book of Poetry' (1857). From 1862 to 1865 he was in the service of the United States government, during the last two years as assistant secretary of war under President Lincoln. About the beginning of 1866 he became editor of the Chicago *Republican,* a daily paper. In 1868 he purchased an interest in the New York *Sun,* also a daily, of which he was editor and chief proprietor until his death. He was a man of forcible character and impressed his personality upon his paper. His literary judgments and perceptions were keen and his own writing exhibited a perfect mastery of English style. Under his management the *Sun* became noted for the literary quality of its editorials. In his later years, however, his intense political partisanship became very marked and greatly diminished the weight of his influence in journalism.

Dana, Charles Loomis, American physician: b. Woodstock, Vt., 25 March 1852. He was graduated from Dartmouth College in 1872, studied medicine and has been professor of nervous diseases in Dartmouth Medical College, and at the medical department of Cornell University. He has published 'Text Book of Nervous Diseases' (1892).

Dana, Edward Salisbury, American mineralogist: b. New Haven, Conn., 16 Nov. 1849. He was graduated from Yale in 1870 and has been a member of the faculty at that institution from 1874, at present (1903) as professor of physics. He has published: 'A Text Book of Mineralogy' (1877); 'Text Book of Mechanics' (1881); 'Minerals, and How to Study Them'; 'Sixth Edition of James D. Dana's System of Mineralogy' (1892).

Dana, Francis, American jurist: b. Charlestown, Mass., 13 June 1743; d. 25 April 1811. He was a son of Richard Dana (q.v.), was graduated at Harvard in 1762, and admitted to the bar in 1767. In 1775 he was sent to Europe on a confidential mission to Benjamin Franklin, carrying letters from Warren, Quincy, and other patriots. He returned the next year and reported to Gen. Washington that the colonies need expect nothing of Great Britain. In 1777 he was elected a member of the Congress that formed the Confederation, and filled various offices during the Revolutionary War. In 1781 he was made minister to Russia, and after his return was again elected to Congress. In November 1791 he was appointed chief-justice of Massachusetts for a term of 15 years.

Dana, Francis, American lawyer and author: b. Singapore, East India, 4 March 1866. He was educated at Saint Paul's School, Concord, N. H., and the Harvard Law School, and besides contributing short stories to periodicals has published 'Lenora of the Yawmish.'

Dana, James Dwight, American naturalist: b. Utica, N. Y., 12 Feb. 1813; d. New Haven, Conn., 14 April 1895. He was graduated at Yale College in 1833; accompanied the American expedition of 1838 to the Southern and Pacific oceans as geologist and mineralogist, and on his return compiled exhaustive reports. In 1835 he became Silliman professor of natural history and geology at Yale, but in 1864 the title was altered to that of professor of geology and mineralogy. Many American and foreign learned bodies conferred distinctions on him. Besides many articles in various journals, he wrote: 'System of Mineralogy' (1837); 'Manual of Mineralogy' (1848); 'Coral Reefs and Islands' (1853); 'Manual of Geology' (1863); 'Text-Book of Geology' (1864); and 'The Geological Story Briefly Told' (1875).

Dana, John Cotton, American librarian: b. Woodstock, Vt., 19 Aug. 1856. He was graduated at Dartmouth College 1878, and admitted to New York bar 1882. He was librarian of the Public Library, Denver, Col., 1889-97; of the City Library Association of Springfield, Mass., 1898–1901, and has since been at the head of the Public Library of Newark, N. J.

Dana, Marvin, American writer: b. Cornwall, Vt., 2 March 1867. He has published: 'Mater Christi and Other Poems'; 'History of Gen. Custer'; 'History of the Mormons'; Wars of the Century'; 'Studies in Criminology'; 'A Brief Universal History.'

Dana, Napoleon Jackson Tecumseh, American soldier: b. Eastport, Me., 15 April 1822; d. 15 July 1905. He was graduated from West Point in 1842, served in the Mexican war and in the Civil War also, becoming major-general. He resigned from the army in 1865, later engaged in mining enterprises, and was president of several railroads.

Dana, Paul, American journalist: b. New York 20 Aug. 1852. He is a son of C. A. Dana (q.v.), and was educated at Harvard and the Columbia Law School. He began journalism on his father's paper, the New York *Sun,* and after the latter's death in 1897, was for several years its editor-in-chief.

Dana, Richard, American jurist: b. Cambridge, Mass., 7 July 1699; d. 17 May 1772. He was a grandson of Richard Dana, the first of the family who came from England and settled at Cambridge in 1640. After practising law at Marblehead and Charlestown, he removed to Boston, where he became a leading barrister. He was distinguished for his prominence in the measures of resistance which immediately preceded the American Revolution. Although devoted to his profession and declining office, he was a leading figure in those important political assemblages, where he sometimes presided, the Boston town meetings from 1763 to 1772. It was the custom of Boston in those troubled times to address the country at large on public affairs under the form of published instructions to the representatives of the town. Warren, Hancock, and the Adamses were on committees for this purpose. Dana was always a member, and often at their head. He reported the papers of 20 Nov. 1767, and 8 May 1770, noted at that time. He was a member of the association of the Sons of Liberty, and at their celebrated meeting of 17 Dec 1769, administered to Secretary Oliver the oath of non-execution of the Stamp Act, and made and signed a solemn official record of that fact, by which he would seem to have exposed himself to the charge of treason under the constructions of those days.

Dana, Richard Henry, the Elder, American poet and essayist: b. Cambridge, Mass., 15 Nov. 1787; d. Boston 2 Feb. 1870. He was a son of Francis Dana (1743-1811 q.v.); studied at Harvard College and was admitted to the Massachusetts bar in 1811. He was connected with the 'North American Review' from its commencement in 1815, and his earliest writings first appeared in that periodical, of which he became joint-editor in 1818. His lectures on Shakespeare's characters, delivered in the principal cities of the Atlantic coast (1839–40), awakened a deep public interest. His principal poems are: 'The Change of Home' (1824); 'The Dying Raven' (1825); 'The Buccaneers' (1827), specially noteworthy for its descriptions of the vicissitudes of ocean scenery. To a periodical publication, 'The Idle Man' (N. Y. 1821–2), of which he was editor, he contributed critical papers and several stories; among them 'Paul Fenton' and 'Edward and Mary.'

Dana, Richard Henry, American jurist and miscellaneous writer: b. Cambridge, Mass., 1 Aug. 1815; d. Rome, Italy, 7 Jan. 1882. He was a son of the preceding. He entered Harvard College in 1832, but compelled on account of an affection of the eyes to suspend his studies in 1834, he undertook a voyage to California in the capacity of a common sailor. This voyage he described in a very interesting book, 'Two Years Before the Mast' (1840, enlarged edition 1869). Returning to college he completed his law course, and was admitted to the Boston bar in 1840, soon securing a large number of admiralty cases. In 1841 he published a treatise on seamanship, 'The Seaman's Friend' (republished in England as 'The Seaman's Manual'), containing a treatise on practical seamanship, a useful dictionary of sea terms, and valuable information on maritime law. In 1859–60 he made a voyage round the world, visiting the Sandwich Islands, China, Japan, Ceylon, India, and Egypt, returning through Europe. In 1861 he was appointed United States attorney for Massachusetts, and was counsel for the United States in the proceedings against Jefferson Davis for treason, in 1867–8. In 1866 he published a copiously annotated edition of Wheaton's 'Elements of International Law.' See Adams, 'Richard Henry Dana: a Biography' (1890).

Dana, Samuel Luther, American chemist: b. Amherst, N. H., 11 July 1795; d. Lowell, Mass., 11 March 1868. For more than a generation he was employed as chemist in the Merrimac Print Works in Lowell, and while there invented a new method of bleaching cotton goods which was very widely adopted.

Dana, William Parsons, American marine artist: b. Boston, Mass., 18 Feb. 1833. He studied in Paris under Picot and Le Poitevin, became a member of the National Academy in 1863 and obtained a third class medal at the Paris Exhibition of 1878 for his 'Gathering Seaweed.' One of his most noted pictures is the 'Chase of the Frigate Constitution,' now on exhibition in a private art gallery in New York city.

Dana, Mrs. William Starr. See PARSONS, FRANCES THEODORA STARR.

Danaë, dăn'ā-ē, in Greek mythology, daughter of Acrisius, king of Argos. She was shut up by her father in a brazen tower, because an oracle had declared that a son of his daughter should put him to death. But Zeus, inflamed with passion for the charming virgin, transformed himself into a golden shower, and descended through the apertures of the roof into her embraces. When Acrisius discovered that his daughter had become a mother he exposed her with her child, in a chest, to the violence of the waves. But the sea-goddesses, anxious for the preservation of the son of Jove, commanded the billows to bear the box safely to Seriphos, one of the Cyclades. Polydectes, or rather Dictys, the governor of the island, received her, and educated the child, which he named Perseus.

Danai. See DANAUS.

Danais, dā'na-īs, a genus belonging to the group *Nymphalidæ* (by some placed in *Papilionidæ*), the largest family of day-flying lepidopterous insects, widely scattered over the globe. *D. crippus* (or *archippus*) is prevalent in all parts of the United States. Its wings are varied with yellow, black, and white bands, and it occurs frequently in summer along country roads, in pastures, and wherever the milkweed, its favorite food, grows. The chrysalis is well known for its beauty of green and gold. The caterpillar is marked with yellow and black bands. *Danais* is a famous globe-traveler, having spread by some unknown means from continents to islands of the ocean, and to Australia. Very beautiful species abound in India. In New Holland it was found that the natives, who called it "bugong moth," valued it highly for food. By means of smothered fires they were able to suffocate and collect the "moths" in large quantities, after which the appendages were removed and the bodies were made into oily cakes.

Danakil, dä-nä-kēl' (singular DANKALI), the Arabic and now general name for the numerous nomad and fisher tribes inhabiting the coast of northeast Africa, from Massowah south to



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Tajurrah Bay, and from there southwest to Shoa. They belong to the Ethiopic Hamites, and are well built and slender, with features indicating an intermixture of Arab blood. In a country of waterless plains, they are generally nomads, living partly by caravan traffic and the slave trade, but mostly on the milk of their flocks.

Danao, Philippines, (1) town on the east coast of the island of Cebú, four miles north of Compostela, and 18 miles north of the town of Cebú. The productions of the interior are important for exports, but the anchorage at Danao is not good enough to encourage steamers to load at this port. The road along the coast is in a good condition. Pop. 15,483. (2) Danao, a hamlet, is on the west coast of South Antique, Panay, four miles north of Dao. (3) A lake in West Leyte, south of Panangua crater. (4) A mountain peak on the island of Luzon. (5) A river in the northeast of Negros Occidental, rising in the crater of Solitario, flows east into a small bay, on the north shore of which is situated Escalante.

Dan'aus, in Greek mythology, the son of Belus and twin-brother of Ægyptus, originally ruler of Libya. Fearing his brother, he fled to Argos, with his 50 daughters, the Danaïdes, and here he was chosen king, in place of Gelanor. The 50 sons of Ægyptus followed him, and under the pretence of friendship, sought the hands of his daughters in marriage. Danaus consented, but on the bridal night he gave his daughters each a dagger, and urged them to murder their bridegrooms in revenge for the treatment he had received from Ægyptus. All did so, except one, Hypermnestra, who allowed her husband, Lynceus, to escape. The fable states that in the under-world the Danaïdes were compelled, as a punishment for their crimes, to pour water for ever into a vessel full of holes. From Danaus, the Argives were called Danai.

Dan'bury, Conn., city and one of the county-seats of Fairfield County; on the New England, and the New York, New Haven & Hartford railroads; 62 miles northeast of New York. It is the greatest hat-making city in the United States, with nearly 30 factories in operation. It has also extensive manufactures of iron, brass, and silverplated ware, bicycles, paper, and foundry and machine shop products. There are a court-house, public library, high school, public parks, electric street railways and lights, soldiers' monument, two national banks, daily and weekly newspapers, and excellent public and private schools. A temporary settlement was made here in 1684, a meeting-house was erected in 1696, and for many years the place was known by the Indian name of Paliquioque. In 1776 the place was made a depository for army stores, and when Gen. Tryon, the British governor of New York, was informed of the fact he headed a force of over 2,000 men, landed at Norwalk, marched immediately upon Danbury, and set fire to the town and stores. Hat-making was begun here in 1780. Pop. (1900) 16,537.

Danby, Francis, Irish painter: b. Wexford, Ireland, 16 Nov. 1793; d. Exmouth, Devonshire, England, 17 Feb. 1861. He studied at the Dublin Academy of Fine Arts, and sent to its exhibition his first picture in 1812. In 1820 he settled at Bristol, established his reputation in 1823 by his 'Sunset at Sea After a Storm'; and in 1825, by his 'Delivery of Israel out of Egypt,' obtained the honor of being admitted as an associate of the Academy. Among his subsequent pictures the most celebrated are the 'Opening of the Sixth Seal' (1828); the 'Age of Gold' (1831); 'The Enchanted Island — Sunset' (1841); 'The Contest of the Lyre and Pipe in the Vale of Tempe' (1842); and the 'Painter's Holiday' (1844). Danby's excellence lay in his delineations of scenery, and the poetic halo with which he contrived to invest them.

Danby, Thomas Osborne, Duke of Leeds; English statesman: b. 1631; d. 26 July 1712. A favorite of Charles II., he became lord treasurer in 1673 and was made Earl of Danby the next year. He was instrumental in bringing about the marriage of the Duke of York's daughter, Mary, to the Prince of Orange, and on the accession of William III. was appointed president of the council, and in 1694 was created Duke of Leeds.

Dance of Death, a grotesque allegorical representation in which the figure of Death under various forms takes the lead, followed by dancers of all ages and conditions. It was frequently drawn by artists of the Middle Ages for cemeteries and cloisters. These representations were common in Germany, and also in France, where they received the name of *Danse Macabre.* This term is supposed by some to be derived from the Arabic *magbarah,* a cemetery, but much more probably from the *Chorea Machabæorum,* or dance of the Maccabees, a kind of dramatic representation performed in the Middle Ages, in which the seven martyred brothers mentioned in the second book of Maccabees (Apocrypha) would appear to have been introduced. A Dance of Death was painted on the walls of the churchyard of the Innocents at Paris, about the middle of the 15th century, which the chapter of St. Paul's in London caused to be copied, to adorn the walls of its monastery. Gabriel Peignot, in the 'Recherches sur les Danses des Morts et sur l'Origine des Cartes á jouer' (Dijon and Paris 1826), investigated the origin of the Dance of Death in France, and explained the dancing positions of the skeletons, by the fact which old chronicles relate, that those who were attacked by the plague ran from their houses, making violent efforts to restore their rapidly declining strength by all kinds of morbid movements. The most remarkable Dance of Death was painted, in fresco, on the walls of the churchyard in the suburb of St. John at Basel, which was injured, in early times, by being washed over, and is now entirely destroyed. This piece has been ascribed to the celebrated Hans Holbein; but it has long since been proved that it existed 60 years before his birth. It was painted at Basel in the year 1431, by an unknown artist, in commemoration of the plague, which prevailed there at that time. It represented Death as summoning to the dance persons of all ranks, from the Pope and the emperor down to the beggar, and was explained by edifying rhymes. That piece contained about 60 figures as large as life. Besides being ascribed to Holbein, as was before stated, it has also been ascribed to a painter named Glauber, but without foundation. Holbein perhaps conceived, from this picture, the idea of his Dance of Death, the original drawings of which are at St. Petersburg. Very fine

engravings of these are in the 'Œuvres de Jean Holbein, par Chret. de Mechel' (Vol I., Basel 1780).

Dance, St. Vitus. See Chorea.

Dancing, a form of exercise or amusement in which one or more persons make a series of graceful movements in measured steps in accord with music. Aristotle ranked dancing with poetry, and Pindar applies the name of "The Dancer" even to Apollo. Dancing corresponds to a universal primitive instinct in man, and is practised by the South Sea Islanders, the Forest Indians of Brazil, the Zulus, the negroes of central Africa, and the native Australians, exactly as it was in the earlier stages of every civilized modern race. Ferocious war-dances were practised by savage warriors, as the North American Indian braves, who brought on a frantic mechanical intoxication capable of carrying them to victory. The Zulu war-dance is a noble exercise for warriors, like the Pyrrhic dance of the ancient Spartans; and the dancing and spinning dervishes in the East, who work themselves into spasms of physical excitement, are still highly esteemed for devoutness and piety. The idea of magic always enters into savage dancing. Thus, the Mandan Indians dance the buffalo-dance to bring game when supplies of food are low. The rain doctors of central Africa dance mystic dances to bring rain; and the wives of the Gold Coast negroes dance a battle-dance to give their absent husbands courage in battle.

The art of dancing dates back to the early Egyptians, who ascribe that invention to their god, Thoth. Among the ancient Jews, Miriam danced to a sound of trumpets, itself an act of worship, and David danced in procession before the Ark of God. Religious processions went with song and dance to the temples; the Cretan chorus moving in measured pace sang hymns to the Greek god, Apollo, and one of the Muses (Terpsichore) was the special patroness of the art. The Phrygian Corybantes danced in honor of Cybele, and the festivals of Rhea Silvia at Rome were also accompanied with wild dances, while during the early festival of Mars the Salian priests sang and danced, beating their shields. The Spartans practised dancing as a gymnastic exercise and made it compulsory on all children from the age of five. The Romans in general considered it disgraceful for a free citizen to dance except in connection with religious rites, but willingly witnessed the performances of professional dancers like the Almé of modern Egypt, and the Bayadères, or Nautch girls, of India. The early Christians practised choral dances, which came into discredit with the love-feasts or Agapæ. A survival of religious dancing is still seen even within the pale of Christendom, where during the Corpus Christi octave a ballet is danced every evening by boys from 12 to 17 years of age, wearing plumed hats and in the dress of pages of Philip III.'s time.

The Puritan ancestors saw deadly sin in promiscuous dancing. Father Mariana tells us that the famous saraband worked more mischief than the plague. The fandango was hotly condemned by the clergy, but when danced before the Sacred College, who wished to see it before prohibiting it, so charmed the judges that they gave it their unanimous approval. Many of the mediæval dances were solemn and stately in character like the *danses basses*, which were danced to psalm tunes at the court of Charles IX. of France. It is said that the whole august Council of Trent danced at a ball given in 1562 to King Philip II. of Spain. The *Gallharde* and *volta* were introduced into France from Italy by Catharine de Medici. Dancing reached its height during the reign of Louis XIV., who was himself an enthusiastic dancer in the court ballets.

The minuet was a favorite in France for a century; and then came the quadrille or *contre-danse*, often connected erroneously with the English country dance; the Ecossaise was first introduced in 1760; the galop was introduced from Germany; the cotillion was fashionable under Charles X.; polka was first danced at the Odéon in 1840 by a dancing master from Prague; the polka tremblante or schottisch, was of Bohemian origin and was first brought out in Paris in 1844; the lancers was introduced by Laborde in 1861; and the waltz, originally Bavarian, and now modified from its original form, promises to retain its supremacy.

Characteristic of particular races or merely of classes of people are such forms of the dance as the Scotch reel, Highland fling, and strathspey, the Irish jig, the negro break-downs, sailors' hornpipe, step-dances, the can-can, morris dances, etc.

A ballet is a theatrical exhibition composed of dancing, posturing, and pantomimic action. The Roman pantomimes bore a strong resemblance to the modern *ballet d'action*. In an entertainment given to celebrate the victory of Actium, the "Trachiniæ" of Sophocles, and an erotic interlude founded on the myth of Leda, were performed in dumb show, the dancers Pylades and Bathyllus taking the leading parts; and the whole wound up with a Pyrrhic war-dance. Some tradition of this form of entertainment, doubtless, suggested the courtly dances which became fashionable in the early days of the Renaissance. The first on record was that given by Bergonzio di Botta, at Tortona, to celebrate the marriage of the Duke of Milan in 1489. This was famous throughout the civilized world. From that time great events, such as royal marriages and births, were celebrated by grand productions of ballet on which enormous sums of money were lavished. These ballets were frequently historical in subject, treating of the siege of Troy, the conquests of Alexander, and similar events. There were also mythological, poetical, moral, and fantastic ballets, on such subjects as the Judgment of Paris, the Seasons, Truth, the Diversions of the Carnival, etc. All these were in five acts, each of which consisted of 3, 6, 9, or 12 entries, and in all of them singing and recitation mingled with the dancing.

Catharine de Medici introduced the ballet into France, and encouraged dances by females that would now be deemed highly improper, to distract the attention of her son, Henry III., from state affairs. Henry IV. was a great supporter of the ballet, no fewer than 80 grand entertainments being given by him between 1589 and 1610. Louis XIII. and Louis XIV. carried their love of ballet to an extreme length, and themselves danced publicly. In 1661 the latter founded an Academy of the Dance, with Quinault as director, and Lully as composer. It was not until 1681 that female dancers appeared in

public, the first being four ladies, who danced "La Triomphe de l'Amour." In the early part of the 18th century the names of professional dancers began to appear, two of the most famous being Mlles. Salle and Camargo, immortalized by Voltaire. The great male dancer of this time was Dupré, the predecessor of the universally known Gaetano Vestris.

In 1697 De la Motte introduced more changes into the ballet, chiefly in the direction of more interesting subjects, and about the same time comic ballets were invented by Danchet; but no important alterations were made till the advent of Jean Georges Noverre in 1749. The dancers wore masks, huge wigs, and headdresses, and hoops. The mask finally disappeared in 1773. Hitherto the form of the ballet had remained practically unchanged, each act being performed by different dancers, and generally in different styles of dancing. Noverre invented the *ballet d'action*, and revived the art of pantomime. Dancing now had dramatic meaning, and the most intricate plots were represented by pantomime alone. The principles of Noverre were carried to great perfection by Vincenzo Galleotti in Copenhagen, and by his successor, Bournonville. Under the Directory a form of grand ballet was revived, in which patriotic songs were a feature.

The history of the ballet since Noverre's time is a history of dancers rather than of dancing. In England, this class of entertainment was never more than an exotic, and has practically no history. The word *balette* is first used in English by Dryden (1667), and the earliest attempt at a descriptive ballet seems to have been 'The Tavern Bilkers,' played at Drury Lane in 1702. Within the last few years an important revival of the ballet has taken place in Italy, where the famous "Excelsior," by the Chevalier Luigi Manzotti, Messalina, Amor, etc., have furnished magnificent examples of the *ballet d'action*.

Skirt-dancing, so called on account of the voluminous skirts made of sheer or flimsy material, which are worn by the dancers and play so important a part in their dances, has become a science and a popular attraction on the stage. The dancers, by the clever manipulation of their draperies and assisted by light effects, assume such forms as flowers; the rose, calla lily, pansies, pinks; butterflies of different colors, and flags of various nationalities; all to the accompaniment of music. Among the most noted skirt dancers were Amelia Glover, Loïe Fuller, the inventor of the serpentine dance, Papinta, and Anna Held.

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Dancing Disease, an epidemic nervous disorder, apparently allied to hysteria and chorea, occasionally prevalent in Germany and Italy during the Middle Ages. In the last-mentioned country the disease was ascribed to the bite of a spider called the tarantula; but as scarcely any of those affected with it had any consciousness of being bitten by a spider or any other insect, and as it has been in every instance chiefly propagated by physical contagion, like chorea, there is every reason to conclude that it had a like origin. In 1734, during the celebration of the festival of St. John, at Aix-la-Chapelle, the streets became crowded with men and women, of all ranks and ages, who commenced dancing in a wild and frantic manner, many losing entire control over themselves, and continuing to dance until dropping down from fatigue, and some, in a moment of frenzy, dashing out their brains against walls. The mania spread to Cologne, Metz, and Strasburg, and gave rise to much imposture, profligacy, and disorder. At the beginning of the 17th century the epidemic began to decline; and is only known now as a nervous affection in individual cases.

Dancing Faun, a frolicsome sylvan creature, half-human, half-goat, corresponding to the Greek Satyr, only gayer and less hideous than his woodland brother; often used in ancient comedy as the very embodiment of humor and mischief. Poets, painters, and sculptors of every age have loved to depict the faun in the madness of dancing.

> Rough Satyrs danced and Fauns with cloven heel
> From the glad sound would not be absent long.
> Milton, Lycidas, i. 34.

Dancla, Jean Baptiste Charles, zhŏñ bäp-tēst shärl dan-klä, French musical composer and violinist; b. Bagnères de Bigorre 19 Dec. 1818. He was a pupil at the Conservatory of Paris, where he took the first prize for the violin in 1833, at the age of 15, becoming professor there in 1857. He displayed remarkable fecundity as a composer, among his works being: a 'Method of the Violin,' studies, sonatas, solos, fantasies, and airs for that instrument; symphonies, trios, and quartettes for stringed instruments; 'Christopher Columbus,' a dramatic scene for an orchestra; a volume of 'Notes and Souvenirs' (1893).

Dancourt, däñ-koor, **Florent Carton,** French actor and playwright; b. Fontainebleau 1 Nov. 1661; d. Courcelles-le-Roi, France, 6 Dec. 1725. Although he personated the first characters in high comedy, he succeeded best as an author in low comedy. He displayed much ingenuity and wit in introducing upon the stage amusing subjects of real occurrence in his time. Louis XIV. was very fond of humorous pieces, and Dancourt often used to read his productions to the king before they were played. Among his dramas are: 'Le Chevalier à la Mode' (1687); 'Les bourgeoises de qualité' (1700); 'Les trois cousins' (1700).

Dandelion, the common and well-known plant, *Taraxacum officinale*, belonging to the chicory family. It yields a milky juice, which in the form of extract is used medicinally as a diuretic and alterative. It contains a bitter crystalline principle called taraxacin. Its root has been used to adulterate coffee in a similar way to chicory, and is used to adulterate chicory itself. The blanched leaves are eaten as a salad. In America it is a common article of food in the spring of the year, boiled and eaten as "greens." It has a naked, hollow stalk, with a single bright yellow flower. The seed is furnished with a fine white pappus, by means of which it is carried far and wide by the wind. The leaves are lanceolate and sinuous, rising from a taproot in the form of a rosette. The plant is probably native in certain parts of America, but is found as a weed in all parts of the civilized world.

Dandie Dinmont, a small terrier, 8 to 11 inches high at the shoulder, and bred chiefly in Scotland as a pet. It is generally bluish-gray, or tan in color; its coat is soft and silky; and its eyes are a soft hazel. It is a gentle and affec-

tionate little creature, and has become celebrated in literature through the writings of Sir Walter Scott, one of whose favorite dogs was among the earliest of this breed.

Dandolo, Andrea, ăn-drā'ä dän'dō-lō, Doge of Venice and Italian historian: b. about 1310; d. September 1354; and made doge in 1343. He carried on a war against the Turks with various success, and greatly extended Venetian commerce by opening a trading connection with Egypt. The jealousy entertained by the Genoese of this new trade produced a war between the two states, which gave rise to a correspondence between the doge and Petrarch, who exhorted him to peace. To Andrea Dandolo is ascribed the compilation of the sixth book of Venetian statutes; but he is most distinguished for his 'Chronicle of Venice,' written in Latin, and comprehending the history of the republic from its commencement to 1342. It is praised for its impartiality, and for its judicious use of authentic documents, and was first published by Muratori in his collection of original Italian historians.

Dandolo, Enrico, ĕn-rē'kō, Doge of Venice: b. Venice about 1108; d. Constantinople 14 June 1205. He was chosen to office in 1192, at the advanced age of 84. He had a defect of sight approaching nearly to blindness; but neither that circumstance nor his age impaired the vigor of his administration, the events of his government being among the principal causes of the Venetian greatness. On the formation of the league for the fourth Crusade, under Baldwin, Earl of Flanders, Dandolo induced the senate to join in it, and by his policy the first hostilities of the armament were directed against Zara, which had revolted from Venice. On the storming of Constantinople, the aged doge, it is said, was the first who mounted the walls. On the Crusaders proceeding to the election of a new emperor of the city Dandolo was first nominated; but in consequence of his age, and the incompatible character of doge, he declined, and the choice ultimately fell on Baldwin. In the sharing of the imperial dominions Venice obtained a full moiety, and Dandolo was solemnly invested with the title of Despot of Romania.

Dan'druff, a condition of scaliness in the head, attended with desquamation or scaling of the superficial layers of epidermis. It may simply indicate a dry and unhealthy skin, or it may be the result of several distinct skin diseases, chief of which is pityriasis. There is usually a slight amount of itching, and on scratching the head large quantities of minute scales are detached and fall on the clothing. Dandruff also occurs from seborrhœa, in which case it is due more to a mild inflammation of the fat follicles of the skin. The sebaceous matter from the glands dries and forms scales. One of the general results arising from dandruff is a gradual loss of hair. The treatment consists in better hygiene of the head, shampoos, and careful stimulation by appropriate tonics. Many of the so-called hair tonics are valueless. Vigorous rubbing of the scalp, with periodical shampooing, is one of the best means of combating this condition, but medical advice should always be sought as to the exact cause of the dandruff. See HAIR.

Dane, Nathan, American jurist: b. Ipswich, Mass., 27 Dec. 1752; d. Beverly 15 Feb. 1835. He was graduated from Harvard in 1778, studied law in Salem, Mass., and began practising in the adjoining town of Beverly in 1782, where he resided until his death. He was among the most eminent lawyers in New England, and was at various times a member of the State legislature. In 1812 he was chosen an elector of President of the United States; in 1814 he was a member of the Hartford convention; and in 1820 he was chosen a member of the convention for revising the constitution of Massachusetts. While he was a delegate from Massachusetts to the Continental Congress in 1780, the best method of providing for the government of the vast territory owned by the Confederacy north and west of the Ohio River came into consideration. It was determined to do this by an ordinance which should establish with much detail not only the foundation of that government, but the leading principles which should prevail in the systems of law and public policy to be in force there. The drafting of this instrument was intrusted to Dane; and it was adopted by Congress without a single alteration, 13 July 1787. The clause in it which has been the subject of most frequent and emphatic remark is that which provides "that there shall be neither slavery nor involuntary servitude in the said territory." The name of the "Northwest Territory" was given to it; and it comprehended all the territory at that time belonging to the Confederacy northwest of the Ohio. Not long before his death, he stated in conversation that not until this ordinance was on the eve of enactment did the thought occur to him of inserting in it this clause respecting slavery. He incorporated in this ordinance a prohibition against all laws impairing the obligation of contracts, which the convention that formed the Constitution of the United States, a few months afterward, extended to all the States of the Union, by making it a part of that Constitution. His 'Abridgment and Digest of American Law' appeared 1823–9. In 1829 he imparted new vigor and life to the law school in Harvard University, in Cambridge, by giving $10,000 (adding $5,000 more in 1831) for the foundation of the Dane professorship of law.

Dane, The Great, one of the breed of large close-haired dogs, originating in Denmark. It is very powerful and intelligent, and is esteemed by sportsmen as a perfect boarhound. These huge dogs resemble the type of the ancient war-dogs. The minimum height of a typical Great Dane is 30 inches and the weight 100 pounds. The body is compact and long; the ears small; eyes small and deep-set. The colors vary, running through gray, mouse-color, white, fawn, red, etc., and sometimes present patches or stripes.

Danebrog, dän'ĕ brŏg, the Danish national flag (*brog* simply meaning cloth), which was carried at the head of the army, like the oriflamme of France. It is red with a white cross in the centre, and, as the legend has it, fell from heaven, as an omen of victory, when the pious Danes under Waldemar II. were besieging the pagan town of Reval. In memory of this auspicious event the king founded the order of the Danebrog, which fell into abeyance, however, at a later period. In 1671, under Christian V., and again under Frederick VI., it was revived. It may be conferred upon all ranks, and may be awarded for military or civil services. The dec-

oration consists of a white enameled gold cross, suspended by a white ribbon with a red border.

Danegeld, dān'gĕlt, or **Danegelt** (A.-S. *Dene,* Danes; *gild, geld,* payment), an ancient annual tax of the Anglo-Saxons, to maintain forces to resist the Danes. It was first paid in 991, when Ethelred purchased the retreat of the invaders, which had reached as far as Maldon. The tax was continued until the time of Stephen, as one of the rights of the crown.

Danelagh, dān'lȧ, the ancient name of a strip of territory extending along the east coast of England from the Thames to the Tweed, ceded by Alfred the Great to Guthrun, king of the Danes, after the battle of Ethandune. This name (Danelagh or Dane-law) it retained till the Norman conquest, and its inhabitants were governed by a modification of Danish law and not by English law. King Canute, to prevent any changes in the laws, had them gathered together and taught to the people.

Danenhower, dā'nĕn-how-ẽr, **John Wilson,** American Arctic explorer: b. Chicago, Ill., 30 Sept. 1849; d. Annapolis, Md., 20 April 1887. He was graduated at the United States Naval Academy in 1870, and took part in a surveying expedition to the northern Pacific on the Portsmouth. He joined the Jeannette expedition, which started from Havre, France, went to San Francisco, and thence sailed, 8 July 1879, for the Arctic Ocean, via Bering Strait. The vessel was lost in the ice and the crew after dragging their boats over the frozen deep for 95 days, reached the open sea. A terrible storm separated the boats and none ever was heard of except the one in which Lieut. Danenhower had embarked. It reached Lena Delta, 17 Sept. 1881, and he arrived in the United States in June 1882. He wrote 'The Narrative of the Jeannette.'

Daneo, Giovanni, jō-vän'nē dā-nā'ō, Italian dramatist: b. St. Rémy, Piedmont, 16 May 1824. He wrote some dramas of very considerable merit: 'Suleika'; 'Elisa di Montalpino'; also novels: 'Memoirs of a Gentleman' and 'The Castle of Bardespina.' His poetical works consist of two volumes of miscellaneous 'Poems' and 'Verses,' with 'Gotama' and 'Rafaëllo Sanzio Temosforo.)

Danes, the natives of Denmark. The first mention of them was early in the 6th century, when they were living on the west coast of the Cimbrian Peninsula, whither they had gone from Scandinavia. Their written literature dates from the 13th century, but ancient runic inscriptions in the old Danish language have been found which date from the Viking age (700–1050). The folk-lore and legends that were transmitted from one generation to another, before printing was invented, are valuable contributions to the literature of the present. There are three separate dialects spoken which are represented by the people of Sweden, Zealand, and Jutland. The Zealand dialect became the literary form about the time of the Reformation, from which period modern Danish dates.

Danes Island, a place made noted by Andrée, the Arctic explorer, who, on 11 July 1897, started from this island on his fatal polar expedition. It is a small island off the coast of the Spitzbergen group and on the northwest.

Danewerk, dā'nĕ-vĕrk (Danes' work), an ancient wall from 30 to 40 feet high and of an equal thickness, constructed of earth, stone, and wood, about the middle of the 10th century, seemingly as a protection against the Saxons. It extended along the southern frontier of Schleswig for a distance of nearly 10 miles, and being defended by a series of forts the Danes relied upon it to check the approach of the German troops during the Schleswig-Holstein war of 1864. It was soon discovered that their army was too weak for the defense of so extensive a line, and the position was abandoned. The wall was soon after leveled to the ground.

Danforth, Moseley Isaac, American engraver: b. Hartford, Conn., 1800; d. 1862. He assisted in the founding of the National Academy of Design, spent 10 years in London, in which period he made some noted drawings of the Elgin Marbles, and returning to the United States devoted his attention mainly to the engraving of bank notes.

Danhauser, Joseph, yō'sĕf dän'how-zẽr, Austrian painter: b. Vienna 18 Aug. 1805; d. 4 May 1845. He turned his attention at first to historical painting, and living for some time at Venice, fell under the influence of the works of Titian and Paolo Veronese, and followed religious painting for a while, later becoming a genre painter, which better suited his talent. Among his historical pictures is 'Etienne the Fortunate Offering the Crown of Hungary to the Virgin' (1832). An altar piece in the cathedral at Erlau, representing the martyrdom of St. John, and an 'Abraham Driving Away Hagar and Ishmael' are noted among his religious pictures. He is perhaps best known by his humorous scenes depicting the manners and customs of Austrian life. Of these there are several in the Imperial Museum at Vienna. Many of his works have been popularized by engraving, such as: 'Cured without knowing it'; 'The Oculist'; 'The Prodigal'; 'Reading the Will'; 'Soup at the Convent'; 'Wine, Women, and Song'; 'Judge and Lawyer'; and 'The Evening Festival,' his last work.

Daniel, Hebrew prophet. He was a contemporary of Ezekiel, and was born of a distinguished Hebrew family. In his youth 600 B.C. he was carried captive to Babylon, and educated in the Babylonish court for the service of King Nebuchadnezzar. After three years he entered into the service of this monarch and discharged his employments with much credit to himself and without violating his conscience. A decree of the king which he could not conscientiously obey occasioned his being thrown into the lions' den. Preserved by a miraculous providence he was subsequently elevated to the office of governor and prime minister in the court of the Persian king Darius. Cyrus finally gave him permission to return with his people to Palestine. He ranks with what are called the "greater," in contradistinction to the 12 "minor" prophets. See DANIEL, BOOK OF.

Daniel, Anthony, French Jesuit missionary in North America: b. Dieppe 1601; d. 4 July 1648. In company with the Sieur de Champlain he came to Quebec in 1633 and was soon after transferred to the mission among the Huron Indians. He was shot during an attack upon the town of Saint Joseph by a band of hostile Iroquois.

Daniel, John Moncure, American journalist, b. Virginia 1825, d. 1865. He became a member of the staff of the Richmond *Examiner* in which capacity his free speech obliged him to engage in several duels. He was appointed minister to Sardinia in 1853, but his indiscreet action in several matters seriously impaired his influence as a diplomatist. During the Civil War he served in the Confederate army for a time, but resuming his editorship of the *Examiner* attacked in its columns the president and treasurer of the Confederacy, and in consequence was obliged to fight a duel with the latter.

Daniel, John Warwick, American politician, b. Lynchburg, Va., 5 Sept. 1842. He served in the Confederate army during the Civil War; subsequently studied law and entered upon the practice of his profession. He was a member of both Houses of the Virginia legislature 1870–72 and 1875–81; and was defeated for governor of his State in 1881. He was a member of Congress 1885–7; entered the national Senate in the year last named and was re-elected at the expiration of his term. He has published 'Attachments Under the Code of Virginia'; 'Negotiable Instruments,' etc.

Daniel, Samuel, English historian and poet: b. Taunton, England, 1562; d. Beckington, Somerset, 14 Oct. 1619. As an historical poet Lucan seems to have been his pattern. He bestowed much labor on the poem which describes, in eight books, the civil wars between the houses of York and Lancaster, 'History of the Civil Wars between the Houses of York and Lancaster.' Daniel contributed much to the improvement of the poetical diction of England. His stanzas, formed with a careful attention to the Italian octave, have more dignity and euphony than most verses of this sort in English literature in the first half of the 17th century. He is not wanting in rhetorical beauty and force. He was also the author of some poetical epistles, pastorals, 57 sonnets, and a few tragedies. The first seem to have excited much attention. During the reign of Queen Elizabeth he wrote a sketch of the history of England till the time of Edward III.— a work learned and clear, without ostentation, and containing useful and acute views.

Daniel, Book of, an important canonical book of the Old Testament. It stands in our Bible, as well as in the LXX. and Vulgate, immediately after Ezekiel, while in the Hebrew canon it is not included in the collection of the Prophets, but appears among the miscellaneous 'Writings.' Delitzsch points out that the book nowhere claims to be written by Daniel, and that its position in the canon shows that it is not properly a prophetic book, but an apocalypse. It is written partly in Hebrew, partly in Aramaic, but forms a coherent whole, which is now divided into 12 chapters, the first half consisting of narrative, the second half of predictions. These predictions are not prophetic speeches like those of the other prophetic scriptures, rebuking the sins of contemporaries, foretelling judgment on the impenitent, and promising Messianic salvation to the repentant and believing; they are minutely detailed apocalyptic visions embracing the history of four successive world-empires — the Chaldæan, the Median, the Persian, and the Greco-Macedonian — culminating in the establishment of the eternal kingdom of the saints of the Most High. Objections to the Danelic authorship of the book were made by the Neoplatonist Porphyry as early as the 3rd century A.D., but first found support in the critical investigations of Bertholdt (1806–8), followed by those of Bleek, De Wette, Langerke, Ewald, Lucke, and others. These investigations have led to the view that the book was not written till the time of the religious persecution of Antiochus Epiphanes, about 168–5 B.C. But the book is certainly of great importance, and "has exercised," says Schurer, "a profound influence upon the form of the Messianic idea. . . . In this book (xii. 2) the hope in a resurrection of the body is for the first time plainly and decidedly expressed. The Messianic hope is here the hope of a glorious future for the nation, but with the double modification that the future kingdom of Israel is conceived of as a universal kingdom and that all the saints who have died will share in it." According to Delitzsch, our Lord's testimony in Matt. xxiv. 15 proves "that Dan. ix. 26, et seq., is a prophecy of the desecration of the temple in the Roman war, not that it is a prophecy then fulfilled for the first time." See Hilgenfeld, 'Die Jüdische Apokalyptik' (1857); and the special commentaries by Hitzig (1850), Auberlen (3d ed. 1874), Hilgenfeld (1863), Caspari (1869), Pusey (1864), Desprez (1879), and Robinson (1882).

Daniel Deronda, George Eliot's last novel, considered by some critics her greatest work. Deronda was brought up in ignorance of his Jewish parentage, but ultimately cast in his lot with his own people. The influence of Deronda remolds the character of the heroine, Gwendolen Harleth, who is unhappily married to Grandcourt. In 'Daniel Deronda' George Eliot had three objects in view: (1) To show the influence of heredity; (2) to show that ideals and sentiments lie at the basis of religion; (3) to contrast a social life founded on tradition (that of the Jews) with mere individualism. The novel was first published as a whole in 1877.

Daniell, John Frederic, English scientist: b. London 12 March 1790; d. 13 March 1845. He was elected a Fellow of the Royal Society in 1814, and devoted himself to chemistry and meteorology. In 1823 he published his 'Meteorological Essays'; and in 1831 was appointed professor of chemistry in King's College, London; and in 1839 published his 'Introduction to Chemical Philosophy.' In 1843 he received the degree of D.C.L. from the University of Oxford, and obtained all the three medals in the gift of the Royal Society. He invented a hygrometer (1820), and a new pyrometer (1830), as well as the electric battery known by his name; and he wrote many valuable papers on chemistry, especially on voltaic combinations and electrolysis.

Daniell, Samuel, English artist and traveler: b. London 1777; d. Ceylon 1811. He was a brother of William Daniell (q.v.). He spent three years at the Cape of Good Hope, and afterward proceeded to the interior of Africa, making sketches of the scenery and people, which he brought home with him to England in 1804, when they were published, with an account of the animals of southern Africa. He afterward went to the island of Ceylon, and during a residence of six years collected a large amount of similar materials, one volume of which was

published, with a description of that country and its inhabitants, in 1808.

Daniell, Thomas, English landscape painter and engraver: b. 1749; d. London 1840. In company with his nephew, William Daniell (q.v.), he made an extraordinary journey through India, for the purpose of preparing sketches and illustrations of the scenery, which were afterward published with the title 'Oriental Scenery' (1808). He was originally a heraldry painter, and became Fellow of the Royal, Asiatic, and Antiquarian societies. He published also 'Views in Egypt'; 'Hindu Excavations at Ellora'; 'Picturesque Voyage to China by Way of India' (1817).

Daniell, William, English painter and engraver: b. 1769; d. 1837. He set out at the age of 14, in company with his uncle, Thomas Daniell (q.v.), upon an artistic exploration of the peninsula of Hindustan. They began their journey at Cape Comorin, and sketched almost every thing beautiful or interesting in the country between that point and Serinagur, in the Himalaya Mountains. They were occupied 10 years in this undertaking. Of their immense number of sketches, they selected and published a portion in a great work entitled 'Oriental Scenery' (1808). William also published 'A Picturesque Voyage to India'; 'Zoography'; 'Animated Nature', etc., and from 1814 to 1825 was engaged in making sketches for 'A Voyage round Great Britain.'

Daniels, Cora Linn, American author: b. Lowell, Mass., 17 March 1852; married Joseph H. Daniels 1874. She has written much for the press and has published in book form: 'Sardia' (1892); 'As it is To Be: Psychical Philosophy' (1892–1900); 'The Nurse'; 'Omar Khayyam'; 'The Bronze Buddha' (1899); 'Encyclopedia of Superstitions of the World' (1901).

Daniels, Frank, American actor: b. Dayton, Ohio, 1860. He was educated in Boston, Mass., and made his appearance on the stage there in 1883. His first success was in 'A Rag Baby' and he has since acted in many farces and light operas.

Daniels, William Haven, American prose writer: b. Franklin, Mass., 18 May 1836. He was for some years in the Methodist ministry. He has published: 'That Boy: Who Shall Have Him?' (1878); 'The Temperance Reform and Its Great Reformers' (1878); 'Moody, His Words, Work, and Workers' (1879); 'Illustrated History of Methodism in the United States' (1880); 'A Short History of the People Called Methodist' (1882).

Danish East India Company. See EAST INDIA COMPANIES.

Danish Language and Literature. See DENMARK.

Danish West Indies. See WEST INDIES, DANISH.

Danites, dăn'īts, a former secret society of the Mormon Church, for militant action against its enemies. It was organized by Joseph Smith at Kirtland, Ohio, 30 March 1836, by a "covenant" to avenge any further expulsion of the Missouri Mormons by mobs; on the basis of a "revelation" of 6 Aug. 1833, justifying any Mormon in "rewarding thine enemy according to his works." The first name chosen was Daughters of Zion, from Micah iv. 13; this not seeming graphic, it was changed to Destroying Angels, or Flying Angels, the former used for many years; then the Big Fan (Jer. xv. 7 or Luke iii. 17); then Brothers of Gideon; finally Sons of Dan, turned by outsiders into Danites, from Gen. xlix. 17. A constitution was adopted, giving the executive power to the president of the Church and his counselors, and the legislative power to the same, with the generals and colonels of the society; this legislature to have power to "administer punishments to the guilty in accordance with the offense." The oath taken by the members was to obey the Prophet and First Presidency "in all things, the same as the supreme God"; to "stand by my brethren," and "uphold the presidency, right or wrong"; and invoking terrible punishments for revealing the secrets of the society. The Mormons have usually denied that the society existed, or if so that it was countenanced by the Church; and Smith's Nauvoo council denied its existence there. Brigham Young, however, boasted of its existence in Salt Lake City. Its actions, from the nature of the case, can only be inferred. It is usually credited with all the deeds of blood charged against the Mormons, including the Mountain Meadows massacre (q.v.). The name was attached by the Douglas Democrats to the administration (Buchanan) Democrats in the Lincoln-Douglas senatorial Illinois campaign of 1858, as an insinuation that they were Buchanan's tools in upholding the Utah rebellion.

Dannat, William T., American figure painter: b. New York 1853. He was a pupil of the Royal Academy, Munich, and of Munkacsy in Paris, and took the medal of the third class in Paris 1883. Among his works are: 'Bavarian Peasant' (1878); 'Aragonese Contrabandist' (1883); 'Castanet Dance; A Quartette' (1884).

Dannecker, Johann Heinrich, yō'hän hīn'rĭH dän'nĕk-ĕr, German sculptor: b. Waldenbach, near Stuttgart, 15 Oct. 1758; d. Stuttgart 8 Dec. 1841. At the Karlschule he devoted himself so successfully to sculpture that a statue of Milo of Crotona, executed in his 17th year, excited great admiration. On leaving he was appointed court sculptor, and three years after visited Paris and Rome. In the latter city he executed a Ceres and Bacchus, which procured him admission into the academies of Bologna and Milan. In 1700 he returned to Würtemberg, and became professor of the fine arts at Stuttgart. From this period he continued his professional labors with most brilliant success, and was patronized by the most distinguished personages in Germany. His acknowledged masterpiece is a statue of Christ, which occupied him during eight years, and the prototype of which is said to have been suggested to him in a dream. His 'Ariadne seated on the Panther' is a splendid work, and in the opinion of some critics is superior as a work of art to his 'Christ.' As a sculptor he occupies an intermediate place between Canova and Thorwaldsen, having blended in the happiest manner the spirited conception of the former with great anatomical skill, careful execution, and nice appreciation of nature. See Radcliffe, 'Schools and Masters of Sculpture' (1894).

Dannemora, dăn-ne-mō'ra, N. Y., a village in Clinton County; on the Chateaugay Railroad; 12 miles west of Plattsburg. Here is located one of the State prisons called Clinton State

Pyrites. The iron ore found in the vicinity is [illegible] p. 4,213

Dannemora, [illegible], Sweden, a [illegible] of the same name, 24 [illegible] northeast of Upsala, in the district of Upsala. It is celebrated for its iron mines, the richest in Sweden, which have been worked uninterruptedly for upward of three centuries, and produce the finest iron in the world. The mine has been sunk more than 300 fathoms, and as part of the workings runs under the lake, great trouble is sometimes experienced in keeping out the water. The total quantity of ore raised is about 70,000 tons per annum. It consists of 85 to 90 per cent magnetic oxide of iron, 7 to 12 per cent silica, and traces of manganese, lime, magnesia, and alumina, the earthy matters being in the proportion to form a fusible slag without further addition. It is almost free from sulphur and phosphorus, and as the charcoal fuel employed in smelting is also free from these impurities, the Dannemora iron enjoys the highest reputation, and is in great demand for conversion into steel.

Dannreuther, dan'roi-ter, **Edward,** English pianist and conductor: b. Strasburg, Germany, 4 Nov. 1844; d. 12 Feb. 1905. He was educated at Cincinnati, Ohio, studied music at Leipsic under Moscheles, and in 1863 went to London and lectured on Wagner, Bach, Beethoven, etc. He conducted the first Wagner concerts in London 1873–4, and has published: 'Musical Ornamentation'; 'Richard Wagner: His Tendencies and Theories'; 'The Music of the Future'; 'On Conducting.'

D'Annunzio, Gabriele. See ANNUNZIO GABRIELE D'.

Dantan, Antoine Laurent, än-twän lō-rōn dän-tän, called Dantan the Elder, French sculptor: b. Saint Cloud 9 Dec. 1798; d. there 31 May 1878. He was a pupil of Bosio, taking the second grand prize of Rome for sculpture in 1823 and the first prize in 1828, the latter for a 'Death of Hercules.' Yielding himself, at first, entirely to the influence of the antique in his art, he afterward found a more original style. He obtained the decoration of the Legion of Honor in 1843, and secured a medal of the third class at the Exposition in 1855. Among his works are: 'Young Bather and Dog' (1835), which took a medal of the first class 1833; 'Drunkenness of Silenus' (1839); a bronze 'Young Girl and Tambourine' (1838); 'Statue of Louis Joseph de Bourbon'; 'Statue of the Marshal de Villars'; 'Bust of the Dauphin of France.' A monumental 'Juvenal des Ursins' was ordered for the Hôtel de Ville in Paris 1848, and 'The Angel Raphael' for the Madeleine 1851. 'Duquesne' was made for Dieppe in 1844, and 'Saint Christopher' for the church of La Villette in 1849. He was the author of many statues decorating the monuments of Paris, the churches of Saint Gervais, Sainte Clotilde, Saint Laurent, the Tower of Saint Jacques, the belfry of Saint Germain l'Auxerrois, and the new Louvre, besides busts for the museum at Versailles, the Senate, and the Comédie Française.

Dantan, Jean Pierre, zhän-pē-är (called 'DANTAN THE YOUNGER'), French sculptor: b. Paris 28 Dec. 1800; d. Rueil 6 Sept. 1869. He was a brother of A. L. Dantan (q.v.). He achieved great reputation for his diverting caricatures of prominent men, such as Paganini, Rossini, Victor Hugo, Frederic Soulie, Balzac, Alexander Dumas, Frederic Le Maitre, and of himself which were exhibited at the Dantan Museum in Paris, but his popularity as a caricaturist injured to some extent his fame as a serious artist. Among his works are statues of Boieldieu, at Rouen, Philibert Delorme, at the Louvre; and busts of Adelaide Kemble, Rose Cheri, Camebert, Jean Bart, Pleyel, Rossini, Talberg, Duke of Wellington, and Lord Brougham.

Dantan, Joseph Edouard, zhō-zef ā-doo-ār, French painter: b. Paris 28 Aug. 1848; d. Villerville 1897. He was a son of J. P. Dantan (q.v.). He was a pupil of Pils, but soon abandoned historical and religious for genre painting. Among his works are: 'The Holy Trinity'; 'An Episode of the Destruction of Pompeii' (1869); 'A Monk Carving a Christ in Wood'; 'Hercules at the feet of Omphale' (1874); 'The Nymph Salmacis and the Young Hermaphrodite' (1876); 'Vocation of the Apostles Peter and Andrew' (1877); 'The Corner of a Studio' 1880; in the Luxembourg; 'Breakfast of the Model' (1881); 'Interior at Villerville' (1883); 'The Studios' (1884); 'The Widower' (1885); 'Modeling from Nature' (1887).

Dante, (originally DURANTE) **Alighieri,** dän'tā a"lē-gē-ā'rē, Italian poet: b. Florence May 1265; d. Ravenna, Italy, 14 Sept. 1321. He was of a family belonging to the lower nobility, and of mixed descent, the Aldighieri, or Alighieri, being originally Teutonic. He lost his father in early life, but his mother watched carefully over his education, which was confided to the eminent philosopher and statesman, Brunetto Latini. He is said to have studied at Bologna, Padua, Naples, and even Paris and Oxford, but we have no means of confirming the statement in any measure. What is tolerably certain is that he had mastered the learning of that age. He was a musician and painter, a theologian and linguist of no mean order. Many of his biographers state that it was in 1274, when nine years of age, that he saw for the first time, and ever afterward devotedly loved, Beatrice Portinari. Others affirm that the event took place shortly before her death, in 1290, three years after she had married a noble Florentine, Simone Bardi. His love for her awakened in him a new life; all the powers of his soul were to be henceforth devoted to immortalize her, and we can watch the struggles of his spirit in that record he has left us of his early years, the 'Vita Nuova.' About the period when Dante reached the age of manhood the Guelfs (the Papal or Church party) were predominant in Florence, whence they had, aided by the Pope and Charles, king of Naples, driven the Ghibellines (the imperial or state party). At Arezzo, on the other hand, the Ghibellines had succeeded in exiling the Guelfs, who implored the assistance of their Florentine friends. A war was declared between the two cities, which was terminated in June 1289 by the battle of Campaldino, in which the Ghibellines were defeated. Dante was there fighting bravely, and contributed not a little to the victory of the Guelfs. In 1291 he married Gemma dei Donati, a daughter of one of the most powerful families of the state, and which belonged to the Guelf

faction. By this lady he had seven children, the youngest, Beatrice, being born about 1301. In 1293 a revolution broke out in the city, headed by Giano della Bella, whereby the priors of the trades took the power into their own hands, and made nobility a disqualification for holding office. The following year, however, Giano della Bella was deprived of power, and the nobles disagreeing among themselves, and splitting into two factions, the Bianchi and the Neri (the White and the Black), the streets of Florence were continually the scenes of sanguinary fights. In order to check the excesses of the greater nobles, a number of the lesser nobility, Dante among them, threw in their lot with the citizens' party. In order to render himself eligible for office Dante had his name inscribed in the books of the physicians and apothecaries, and in June 1300 was nominated a prior of the trades, one of the highest offices in the state. Although leagued by marriage to the Guelf side, Dante was no rampant partisan, and on one occasion, when roused by some fresh act of atrocity, he proposed and carried a law to the effect that the heads of the Bianchi and Neri parties should be temporarily banished. It appears that the Bianchi and Neri were originally Guelfs, but the latter were the extreme Papal party, and the former leaned toward a reconciliation with the Ghibellines. Dante's sympathies were with the Bianchi, and on the too hasty return of one of the exiles, Guido Cavalcanti, a friend of the poet's, and one of the Bianchi, Dante was charged with undue partiality in permitting him to remain in the city. The Neri wrote to the Pope that the Bianchi were making common cause with the Ghibellines, and Boniface VIII. sent Charles of Naples to occupy the town, and keep down the turbulent spirit of the Florentines. The Neri were allowed, however, to commit the greatest excesses unchecked by Charles; many of their rivals were slain in the open street, and their houses burned to the ground; among others that of Dante, who had been sent to Rome by his party to try to influence the Pope in their behalf. Taking advantage of his absence, his enemies obtained a decree of banishment against him, together with the heads of his party, and he was further condemned to pay a fine of 8,000 florins, or have his property confiscated (January 1302). Two months later a second sentence was launched against him and several of his friends: they were condemned to be burned alive for malversation, peculation, and usury. The fine he refused to pay, as it would imply a confession of guilt.

From this time forth the life of the poet becomes semi-mythical. We find some traces of him first at Arezzo, then at Sienna, then at Verona. He himself says, "Through almost all parts where this language (the Italian) is spoken, a wanderer, well nigh a beggar, I have traveled, showing against my will the wounds of fortune." His sympathies now lay entirely with the Ghibelline party. The expedition of the emperor, Henry VII., into Italy (1310) roused the hopes of Dante to the highest pitch. He wrote the emperor that famous letter advising him first of all to crush the hydra, Florence, as being the cause of all the misfortunes of Italy. Henry, however, spent his time in foolish inactivity till his death in 1313. Shortly after this event Dante is said to have visited Paris; but according to Balbo he spent the year 1313–14 in Pisa and Lucca, and then took refuge with Can Grande della Scala at Verona, where he remained till 1318. In 1316 Florence sent forth a decree permitting the exiles to return on conditions of fine and penance, which Dante indignantly refused. In 1320 we find him at Ravenna staying with his friend Guido Novello da Polenta. In the following year, on his return from an embassy to Venice, his wanderings and sufferings were ended by death. He was buried in the Church of the Minorites, under a monument built by his friend Guido Novello, on which was an epitaph written by Dante himself. Such, imperfectly sketched, was the career of the great poet: by it he gained a sense of the nothingness of earthly honors and prosperity possible only to the rich, and a knowledge of man possible only to the poor. In his youth living amid the excitement of the tented field and penning sonnets to his adored Beatrice; in his old age compelled "to climb the stranger's toilsome stairs, and eat the bitter bread of others." Out of his misfortunes the world found her rich account; the apocalypse of the Middle Ages, the 'Divina Commedia,' was begun and finished in his year of exile. Of this grand poem we can give only a very brief analysis. It is divided into three parts: Hell, Purgatory, and Heaven. Each part is subdivided into 33 cantos, in allusion to the years of our Saviour's life, the extra canto in the first part being introductory. Dante dreams that he had "reached the halfway point in his path of life, at the entrance of an obscure forest." He would advance, but three horrible beasts bar the way; then the shade of Virgil appears and offers itself as his guide. Dante accepts, and then takes place that wondrous journey in the "world of souls." Virgil tells him he can only accompany him through hell and purgatory; but that Beatrice shall conduct him through those happy spheres, the portals of which a pagan may not enter. Now begin the peregrinations of the Florentine through the regions of the damned, over the entrance of which is written the awful words—"All hope abandon ye who enter here." This is the most impressive and best-known part of the poem: the singular diversity of the chastisements; the rapidity with which Dante passes in review the great criminals of history; the intensity with which he paints, at a single dash, so to speak, their distorted features; the grace of certain episodes (the adventure of Francesca da Rimini, the death of Ugolino, and that of Manfred), attest a vigor of imagination never surpassed, if ever equaled. From Hell (which the poet places in the centre of the earth) he ascends to Purgatory, a solitary mountain rising from the ocean on the side of the globe opposite to us. This mountain is divided into terraces, and its top is the terrestrial paradise, the first abode of man. In Purgatory there are still scenes of pain and suffering; but these punishments are only temporary. The poet hesitates when he comes to a path filled with a sheet of flame; but Virgil speaks: "Between Beatrice and thee there is but that wall." Dante at once plunges into the heart of the flames. The two poets have now reached the earthly paradise, and behold Beatrice surrounded by a scene of surpassing magnificence; noble forests, whose trees are gently moved by celestial zephyrs; the melodious songs of birds to which the murmuring of the sacred woods and streams give harmonious re-

ply; meadows of the freshest green, and groves of deepest shade. From this enchanting region Dante ascends, faster than tongue or pen can tell, into the celestial paradise. This realm consists of 10 heavens or circles. Dante roams at first over the seven planets, the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn; then he enters the eighth sphere, and at last into the empyrean. Each of these globes has its inhabitants, who are souls or spirits. Arrived at the eighth sphere, he looks down upon our globe; but the earth appears so abject that he smiles with pity upon it. Beatrice calls his attention to a nobler scene. "See the glorious company which surrounds the triumphant Redeemer." The eyes of the poet cannot sustain the splendor of the view. In the ninth sphere Dante feels himself in the presence of the Divine essence, hid from his sight by three hierarchies of angels. He sees the souls of the blessed on thrones in a vast amphitheatre, whose steps and circles widen into infinity. Beatrice takes her place upon her throne of glory; from that sublime height she smiles benignantly down upon the poet; then turns toward him who is the source of life and light. Thus ends the Divine trilogy, the noblest effort of the Middle Ages.

The name "Commedia" is derived from Dante's idea concerning the forms of eloquence, which were in his opinion tragic, comic, and elegiac, as he relates in his work 'De vulgari Eloquio,' which was first written in Latin. What he called tragedy was a piece commencing with happy and peaceful scenes, and ending with events of a painful and terrible character, and what he called comedy was a piece which, beginning unpleasantly, terminated happily. The qualifying word divina was, however, added by others. We may mention the opinion maintained in 1753 by Bottari, that Dante made use of the 'Vision of Alberico' a monk who lived in the 12th century, in a monastery on Monte Cassino, in Naples. There have been many such visions from the earliest ages of Christianity; as, for instance, the 'Vision of an English Monk,' which Matthew Paris mentions in his 'History of England' (in the year 1199), and which resembled Dante's poem much more than the 'Vision of Alberico' published by Cancellieri in 1814 at Rome, with observations ('Osservazioni intorno alla Questione sopra la Originalità della Divina Commedia di Dante'). It is possible that Dante here and there may have borrowed a thought or image from those visions; but this is no fault: the recollections of great men are sparks which serve to kindle mighty flames.

There is no poet who bears so distinctly the impress of his age, and yet rises so high above it, as Dante. The Italians justly regard him as the creator of their poetical language, and the father of their poetry, which, regulated and controlled by his genius, at once assumed a purer and far nobler form than it had previously worn. The terzina first reached its perfection in the time of Dante, on which account he has been erroneously regarded as the inventor of it.

Florence soon recognized that she had lost her noblest son. In 1350 a sum of 10 golden florins was ordered to be paid by the hands of Giovanni Boccaccio to Dante's daughter, Beatrice, a nun in the convent of Santa Chiara at Ravenna. In 1373 an annual sum was granted for public lectures, to explain the 'Divine Comedy' in the churches, and Boccaccio was one of the first lecturers. A monument was voted for if Ravenna would give up the now sacred remains, which that city refused, and has repeatedly refused to do. In May 1865 all Italy assembled at Florence to render homage to the seer who prophesied so confidently her unity; and the following year a colossal statue of the poet was erected on the Piazza della Croce.

The best editions of the 'Divina Commedia' are those of Lombardi (1791), frequently reprinted with valuable improvements, of Viviani (1823), of Bianchi (5th edition, Florence, 1857), of Karl Witte (Berlin 1862), etc. In 1821 Luigi Fantoni published an edition of the 'Divina Commedia,' stated to have been printed from a manuscript in the hand-writing of Boccaccio. In 1860 the 'Vernon Dante' was published in London by Lord Vernon, in three large volumes folio. It contains the text of the 'Inferno,' and, in Italian, an explanation of everything in the text regarding which any reader might have the least difficulty; together with an immense mass of information — biographical, topographical, historical, etc., relating to the life and times of Dante, and a large number of maps, plans, and illustrative plates. Dante's complete works appeared at Venice in 1757–8, published by Zatta (in 5 vols. 4to). His lyric poems, sonnets, and canzonets, of which some are beautiful, others dull and heavy, were written at different periods of his life. We have yet to mention his 'Banquet' (Il Convito) — a prose work worthy, says Bouterwek, to stand by the side of the best works of antiquity. It contains the substance of all his knowledge and experience, and thus illustrates his poetry and his life. The most popular English translation of the 'Divina Commedia' is that by Cary in blank verse (1814). Longfellow executed a faithful poetic version (1867); and that by Dean Plumptre in the original metre deserves mention. Other English translations are Boyd's (1785); Wright's (1833); Pollock's (1854); Parsons-Norton's (1891–2). The German translations are numerous, and are highly praised for faithfulness and force. The translation by Kannegieser is in the measure and rhyme of the original; that of Philalethes (King John of Saxony) has a deservedly wide reputation. The French have four or five translations, including one by Lamennais, but that graceful and feminine tongue is incapable of doing anything like justice to the manly thoughts of Dante.

In one respect Dante stands unrivaled by any man, as he, we might almost say, created the language, which he elevated at once to its highest perfection. Before him very little was written in Italian, Latin being the literary language; but no one attempted to use the *lingua volgare* for the purposes of dignified composition. The poet, indeed, thought it necessary to excuse himself for having written in Italian after having attempted to compose his poem in Latin. Thus he is to be regarded as the founder of Italian literature. One of the strangest productions of Dante is his 'De Monarchia.' He labors in this work to prove that the emperor ought to have universal authority and draws his arguments from the sacred Scriptures and from profane writers, which in this book appear very often with equal authority. The dialectics of the schoolmen are here exhibited in a most characteristic way. The 'De Monarchia' is valuable as a source of information respecting the great

struggle of the Guelfs and Ghibellines, and its influence upon the Christian world at that time. This struggle was a part of the great convulsion attending the separation of the civil power from the ecclesiastical, with which in the earliest ages it is always united. On the whole, Dante's works are important chiefly in three respects — as the productions of one of the greatest men that ever lived, as one of the keys to the history of his time, and as exhibiting the state of learning, theology, and politics in that age. To understand Dante it is necessary to be acquainted with the history and spirit of his time, particularly with the struggle of the Guelfs and Ghibellines, the state of the north of Italy, and the excitement caused by the beginning of the study of the ancients; also to have studied the Catholic theology and the history of the court of Rome, and to keep always in mind that Dante was an exile, deprived of home and happiness. The personal appearance and character of the man are thus described by Boccaccio: "Our poet was of middle height; his face was long, his nose aquiline, his jaw large, and his under lip protruding somewhat beyond the upper. His eyes rather large than small; his hair and beard thick, crisp, and black, and his countenance sad and pensive. His gait was grave and gentlemanlike, and his bearing, in public or private, wonderfully composed and polished. In meat and drink he was most temperate. Seldom did he speak unless spoken to, though he was most eloquent. In his youth he delighted in music and singing, and was intimate with all the musicians and singers of the day. He was of marvelous capacity and the most tenacious memory; inclined to solitude and fond of study when he had time for it."

Bibliography.— Balbo, 'Vita di Dante' (1839); Missirini, 'Vita di Dante' (1844); Fraticelli, 'Vita di Dante' (1861); Scartazzini, 'Dante Alighieri, seine Zeit, sein Leben, und seine Werke' (1897); Kraus, 'Dante, sein Leben und sein Werk' (1897); R. W. Church, 'Dante: an Essay' (1879); M. F. Rossetti, 'A Shadow of Dante' (1871); Lowell, 'Among My Books' (2d Series 1876); Moore, 'Textual Criticism of the Divina Commedia' (1889); Scartazzini, 'Dante in Germania' (1881–3); Symonds, 'Introduction to the Study of Dante' (1890); Butler, 'Dante: His Times and His Work' (1895); Botta, 'Introduction to the Study of Dante' (1887); Creighton, 'Historical Essays and Reviews' (1902).

Danton, Georges Jacques, zhŏrzh zhäk däṅ-tôṅ, French revolutionist: b. Arcis-sur-Aube 26 Oct. 1759; d. Paris 5 April 1794. He played a very important part during the first years of the French Revolution, of which he was an active and zealous promoter. His external appearance was striking: his stature was colossal; his frame athletic; his features harsh, large, and disagreeable; his voice shook the dome of the chamber of the assembly; his eloquence was vehement; and his imagination was as gigantic as his person. These qualities contributed to extend his influence, and he became one of the founders of the club of the Cordeliers. After the capture of Louis XVI. at Varennes he took the lead in the meeting of the Champ-de-Mars, which demanded the dethronement of the king. He was foremost in organizing and conducting the attack on the Tuileries (10 Aug. 1792), and a few days afterward was appointed minister of justice by the legislative assembly in recognition of his services on that occasion. He also became a member of the provisional executive council, and usurped the appointment of officers in the army and departments. Money flowed from all sides into the hands of the minister, and was as profusely squandered on his tools and partisans. He endeavored by the terrors of proscription to annihilate all hope of resistance on the part of the Royalists. The invasion of Champagne by the Prussians, 2 September, spread consternation through the capital and among the members of the government. The ministers, the most distinguished deputies, and even Robespierre himself now assembled around Danton, who alone preserved his courage. He assumed the administration of the state, and prepared measures of defense; called on all Frenchmen capable of bearing arms to march against the enemy, and prevented the removal of the assembly beyond the Loire. The close of his celebrated speech has been often quoted: "Le tocsin qu'on va sonner n'est point un signal d'alarme, c'est la charge sur les ennemis de la patrie. Pour les vaincre, il nous faut de l'audace, encore de l'audace, toujours de l'audace, et la France est sauvée!" From this time forward he was hated by Robespierre, who could never pardon the superiority which Danton had shown on that occasion. He voted for the capital punishment of all returning emigrants, and undertook the defense of religious worship. The contest between the Girondists and the Mountain daily assumed a more serious aspect, and Danton appeared to fear the consequences of these dissensions. Danton wished to overthrow the despotism of Robespierre, and the crafty Robespierre endeavored to undermine him, in order to get rid of a dangerous rival. St. Just denounced him to the Committee of Safety, and Danton was arrested on the night of 31 March 1794, together with those who were called his accomplices. Being thrown into prison in the Luxembourg he maintained the appearance of serenity. When transferred into the Conciergerie his countenance became dark, and he appeared mortified at having been the dupe of Robespierre. All his discourses were a strange mixture of sorrow and pride. At his trial, on the formal question as to his name and residence being put, he answered, with perfect composure, "I am Danton, sufficiently known in the Revolution; I shall soon pass to nothingness, but my name will live in the Pantheon of history." On 5 April the revolutionary tribunal condemned him to death as an accomplice in a conspiracy for the restoration of monarchy, and confiscated his large property. He mounted the fatal car with courage, and without assistance; his head was elevated; his look commanding and full of pride. Before ascending the scaffold he was for a moment softened. "Oh my wife, my dear wife! shall I never see you again?" he exclaimed, but checked himself hastily, and, calling out, "Danton, no weakness!" ascended the scaffold.

See Robinet, 'Danton, Mémoire sur la vie privée' (1865); Bougeart, 'Danton' (1861); Dubost, 'Danton et la Politique Contemporaine' (1880); Gronlund, 'Ca ira! or Danton in the French Revolution' (1882); Beesley, 'Life of Danton' (1889); Morse-Stephens, 'Orators of the French Revolution' (1892); Belloc, 'Danton: a Study' (1899).

Dantzic, Dantsic, or Danzig, dant'sik, Germany, city and port of Prussia, capital of the province of West Prussia, 253 miles northeast of Berlin, on an arm of the Vistula (now cut off by a dam from the river), about three miles above its mouth, and on the Mottlau, several arms of which traverse the town. It is one of the most important seaports under the Prussian monarchy, as well as one of its chief commercial entrepôts. It is nearly circular in form, and ranks as a fortress of the first class, being surrounded by walls and bastions, defended by a citadel and several outworks, and also provided with the means of laying a considerable part of the surrounding country under water. It is entered by four gates, has nine suburbs, and is divided into five parts — the Old, New, and Low town, the Speicher (granaries), an island, and Langgarten. The last is the more modern part of the town, and is regular and well built. The principal edifice is the Dom, or cathedral, begun in 1343, but not finished till 1503. It is 360 feet long by 142 feet broad, and its vaulted roof, 98 feet above the pavement, is supported by 26 slender brick pillars. It possesses a fine brass font and a curious astronomical clock, which has long ceased to move, but its chief attraction is a painting of the 'Last Judgment,' attributed to John Van Eyck. The other buildings and institutions deserving of notice are the town-house, the church of St. Catharine, the oldest in Dantzic, and other churches; three monasteries, convents, two synagogues, the exchange, an imposing Gothic edifice, built in 1379. Many of the modern public buildings are models of architecture. It is the seat of the provincial government, and contains the various offices connected therewith; and is also the residence of several foreign consuls. The industrial establishments include an imperial shipbuilding yard employing some 1,500 men, several other shipyards, works for artillery and firearms, iron foundries, machine shops, steel works, breweries, distilleries, works producing the liqueur called Danziger Goldwasser, or Eau de Vie de Dantzig, flour-mills, saw-mills, paper-mills, rope, wire, oil, chemical, soap, and glass works. Great efforts are being made to extend the manufacturing industries of the town, since as a shipping centre it seems to be declining owing to the competition of other ports, some of them more favorably situated. But the trade carried on is still very important, since the total value of exports and imports together amounts to about $50,000,000 per annum. Much of the trade is of products in transit. Among imports the chief are coal, iron, cured herrings, salt, tallow, and lard, petroleum, rice, coffee, and some bread stuffs. The chief exports are timber, beet-sugar, grain and seeds, oil-cake, flour, spirits, and molasses. Dantzic has a great trade in grain, especially wheat, rye, and barley, for the warehousing of which there are immense granaries on the island of Speicher, capable of containing 100,000 tons. The wheat, which is chiefly Polish, is remarkable for both the quantity and the quality of the flour which it yields. There is considerable trade at Dantzic in amber, which is manufactured into various ornamental articles. The proper port of Dantzic is Neufahrwasser, at the mouth of the Vistula (now known as the dead Vistula), and connected with it by an artificial channel. Here a free port has recently been established. By dredging and otherwise, various obstructions to navigation have been removed, and vessels of large size come up close to the town. The history of Dantzic reaches back to the times of historical obscurity. As early as 970 there was a town here. In 1271 it was taken by Mestwin, and in 1294 by the Poles. In the 14th century it fell into the hands of the Teutonic knights, under whose sway the town increased, and its commerce was extended. Left by the Teutonic knights, it again, in 1454, fell into the hands of the Poles, who granted it important privileges. After enduring many vicissitudes of fortune, on the second partition of Poland, in 1793, it came into possession of Prussia. It was besieged, bombarded, and taken by the French in 1807, and retaken by the Prussians in 1814. Since that time Prussia has done much for the town; but its commerce has never regained its former importance and extent. Pop (1901) 140,303.

Danube (ancient, DANUBIUS; German, DONAU; Hungarian, DUNA), a famous river of Europe, originating in two small streams, the Brege and the Brigach, rising on the east slope of the Schwarzwald, a mountainous region of southwest Germany (the Black Forest), in the Grand-duchy of Baden, at an elevation of 2,850 feet above sea-level, and uniting at Donaueschingen. Its general course is from west to east, and it flows into the Black Sea by four different outlets, called respectively the Kilia, Stambool, Sulina, and the Edrillis or St. George's mouths. The Sulina mouth or channel is the deepest. The extent of the basin of the Danube is about 300,000 square miles, and its total length is about 1,875 miles. The Danube basin comprises portions of Austria-Hungary, Germany, Servia, Bosnia, Rumania, and Bulgaria. From its source it flows northeast to Ratisbon, in Bavaria, whence it takes a southeast course, by Vienna and Pressburg, to Waitzen, in Hungary. Here the course is changed to nearly due south to the point where it receives the waters of the Drave, near Esseg, in Slavonia; thence it flows southeast to Belgrade, on the north boundary of Servia, and for some distance it forms the boundary between Servia and Austria. The course continues in an easterly direction to Orsova (the Iron Gate), where it changes to southeast, then again nearly east, forming for a long distance the boundary line between Rumania and Bulgaria. At Silistria, in Bulgaria, it turns more to the north, through Rumania to Galatz, then southeast between Rumania and Bessarabia, in Russia, and finally into the Black Sea.

The great basin of the Danube has been divided into four minor basins. The first consists of a vast plateau 1,640 feet above sea-level, 150 miles in length, and 125 miles broad, surrounded by mountains, and comprising a portion of the principality of Hohenzollern, part of the kingdom of Würtemberg, and the greater part of the kingdom of Bavaria. This tract is by far the most fertile and most populous through which the Danube passes during its entire career. The principal branches within this space are the Iser and Lech.

The second basin belongs to the empire of Austria, having Vienna nearly in its centre, and comprising the archduchy of Austria, Hungary as far east as Waitzen, and Styria. It is very irregular, and is bounded by very high moun-

tains. The soil is rich in mineral products, and the climate one of the best in Europe. The principal branches in this basin are the March or Morava, and the Enns — the former from the left, and the latter from the right. The Danube here passes through a succession of the most picturesque scenery.

The third basin of the Danube comprises Hungary east of Waitzen, and the principality of Transylvania, and consists of an immense plain, almost without undulations of any kind, and only 394 feet above the sea-level. It is intersected by large rivers with marshy banks, and interspersed with stagnant pools, saline and sandy wastes. It comprises about one half of the entire basin of the Danube. The marshes cover a space of 3,053 square miles. The principal branches in this basin are the Save, the Drave, and the Morava. From Budapest to Belgrade the river passes through an immense plain covered with sand and alluvium, through which it is constantly forming new channels and filling up the former ones. Below Moldava it passes for 60 miles through a succession of rapids and shallows, interspersed with rocks and sand-banks, where it has cut a passage for itself through the cross chain of hills which connect the Carpathian Mountains with the Alps; and between Drenkova in Hungary, and Scala Kladova in Servia, the navigation is partially interrupted by three great rapids, the principal or last and lowest of which is the famous Iron Gate, where the stream rushes through a narow channel between stupendous rocks, ending with a series of whirlpools, eddies, and smaller falls. By the removal of various obstructions vessels drawing nine feet have long been able to pass at certain seasons; and by works carried out in 1890–6, and extending over some 50 miles, a permanent waterway has been secured.

The fourth basin comprises Rumania, a portion of Bessarabia, and Bulgaria. This tract is flat, inundated, and marshy along the banks of the river; dry and mountainous on the borders of the basin. The principal branches in this basin are the Aluta, Sereth, and Pruth. In the lower part of its course the Danube increases in width from 1,400 to 2,100 yards; and in one part it forms an expanse of water like a sea, and is studded with islands. Excepting between Drenkova and Kladova, the Danube may be said to be navigable for steamers from Ulm to the sea, although in some places navigation is rendered difficult by shallows and sand-banks, intersected by narrow and intricate channels. The outlets of the Danube are separated from each other by several low islands covered with reeds and trees. The greater part of the ships bound up the river enter it by the Sulina mouth. The Danube has 60 navigable tributaries, and its volume of water is nearly equal to that of all the rivers that empty themselves into the Black Sea taken together. Its rapidity is in many places above Orsova so great as to render navigation difficult, but below that point its current is less rapid. A number of steamers now ply on the river between its principal towns. The principal towns on the banks of the Danube are Ulm, in Würtemberg; Regensburg (Ratisbon) and Passau, in Bavaria; Linz and Vienna, in Austria; Pressburg, Budapest, and Peterwardein, in Hungary; Belgrade, in Servia; Widin, Nicopolis, Rustchuck, and Silistria, in Bulgaria; Brahilow and Galatz, in Rumania.

Danube Navigation Commission, an international commission, constituted in 1856, when at the Peace of Paris the navigation of the river was declared free to all nations. It was composed of delegates of all the great powers, to whom a representative of Rumania has been added since 1878. It was appointed on the express condition that it should dissolve in 1858, but such was its usefulness that it was informally continued till 1866, when the Conference of Paris formally prolonged its powers for five years. In 1871 the Conference of London continued the commission for 12 years, and in 1883 a second London conference extended its existence for 21 years. It exercises almost sovereign power on the mouths of the Danube, where it has conducted great engineering works; it has its own flag, uniform, and revenue, and has raised loans, made laws, and maintained its own small army of police. Its jurisdiction, originally limited to the river between Isaktcha and the sea, was extended at the Congress of Berlin (1878) as far as Galatz, and afterward to the Iron Gate; but in the last-named portion of the stream its authority is exercised only by delegation to the Riverain Commission of the states on the bank, or on appeal from its decisions.

Danubian Principalities. See MOLDAVIA; RUMANIA; WALLACHIA.

Danvers, Mass., town in Essex County, on the Boston & Maine Railroad, five miles northwest of Salem. It was a portion of Salem till 1756, and the Salem village parish where the witchcraft excitement broke out is included in the present Danvers. It is the seat of Peabody Institute, founded by George Peabody, a resident of the place, who in 1852 donated $200,000 for the promotion of knowledge and morality among the inhabitants. It is also the seat of Danvers Insane Asylum, built at a cost of $2,000,000, and has extensive manufactures of shoes, bricks, and carpets, and has foundries, rolling mills, tanneries, churches, high school, weekly newspapers, public library, a national bank, and good public and private schools. Pop. 8,600.

Danville, Ill., city, county-seat of Vermilion County; on the Vermilion River, and the Wabash, Chicago, and Eastern Illinois, and the Cleveland, Cincinnati, Chicago & St. Louis railroads; 125 miles south of Chicago. It has a National Soldiers' Home for disabled veterans, with over 3,500 inmates. Its chief industry is coal mining, which is carried on extensively on the bluffs of the river. It also has large railroad car and machine shops, iron foundries, planing-mills, carriage and wagon factories, organ and furniture factories as well as churches, a high school, three national banks, daily and weekly newspapers. Pop. (1900) 16,354.

Danville, Ind., county-seat of Hendricks County; situated on the Cleveland, Cincinnati, Chicago & St. Louis Railroad, about 20 miles west of Indianapolis. The manufacture of flour and lumbering are the principal industries. It is the site of the Central Normal College, a private institution. Pop. (1902) 1,802.

Danville, Ky., city, county-seat of Boyle County; on Dick's River, and the Cincinnati Southern Railroad, 42 miles south of Frankfort. It is a stock-raising centre, and the seat of several educational institutions, among them

the Danville Theological Seminary, the Southern Collegiate Institute, Center College, the Caldwell Female Institute, and also the State Asylum and School for Deaf-mutes. It has churches, public schools, three national banks and weekly newspapers. Pop. (1900) 4,285.

Danville, Pa., a borough and county-seat of Montour County; on the Susquehanna River; under the Pennsylvania, the Lackawanna, and the Philadelphia & Reading railroads; 154 miles northwest of Philadelphia. Danville is in a district abounding with iron ore, limestone, and anthracite coal; and contains the first establishment erected in the United States for the manufacture of railroad iron. It still ranks among the most extensive iron manufacturing places in the country. There are blast furnaces, iron foundries, rolling-mills, churches, two national banks, the Danville Institute, a State asylum for the insane, and daily and weekly newspapers. Pop. (1900) 8,042.

Danville, Va., city and county-seat of Pittsylvania County, on the Dan River, 140 miles southeast of Richmond, on the Danville & Western and the Southern R.R.'s. One of the oldest cities in the South; incorporated as a town in 1792. For a short time during the last days of the Southern Confederacy it was the seat of government. It is located in the famous and picturesque Piedmont section of Virginia, on a gradual slope extending from the river to an altitude of 600 feet above the sea. The river furnishes power for the cotton-mills, flour-mills, foundry, ice factory, and electric-light plant; and further development of its water power is now being made about three miles up the river, at an estimated cost of $2,000,000. Danville is the largest loose tobacco market in the world, her average annual sales being 50,000,000 pounds. The surrounding country is well adapted to grain, fruits, and tobacco. The improvements in public utilities within the past three years include larger water mains in the down-town district (16 inch), and additional fire engines (not including further improvements now under consideration) at a cost of $23,000; Main street repaved with Belgian block and Mack brick, $100,000; Craghead street, same material, $24,500, and several other less important streets paved with cobble. Further extension of the sewerage system from time to time as the growth of the city requires; new electric-light plant owned by city, with new $5,000 incandescent machine, furnishing lights for streets, business, and dwelling-houses; electric railway system rebuilt at a cost of about $320,000, first-class equipment, double track on Main street, about eight miles of track, new power-house, with double set of dynamos and engines. The Southern Bell Telephone and Telegraph Company has expended about $30,000 in improvements, and the growth of their business has been such as to require a much larger additional switchboard, which was installed recently. Danville is the seat of Roanoke Female College (Baptist), established 1859, Randolph Macon Institute for Young Ladies (Methodist), founded in 1883, and Danville Military Institute, established in 1890. The climate of the city is mild and pleasing, the streets well shaded and paved, and as a residential city it is excelled by few locations in the South. There are many new public buildings, churches, and schools; a general hospital recently enlarged and fitted with the latest improvements, seven banks — one national, five State, and one private, and two daily newspapers. Under the new constitution of the State the municipal government is administered by a mayor, elected quadrennially, and a city council, composed of two branches having different numbers, which controls appointments to most of the administrative offices. The water works, electric light and gas plants are owned and operated by the municipality. Pop. (1890) 10,303; (1900) 16,520.

Danzig. See DANTZIC.

Daphænus, an extinct genus of *Canidæ* of the Oligocene Epoch in North America. It has many primitive characters, such as small brain, long tail, short limbs, and five toes on each foot, with somewhat retractile claws. The third upper molar tooth, lost in all modern dogs, was present in *Daphænus*, giving it the complete primitive series of 44 teeth. It is considered to be a nearly direct ancestor of the modern dogs, wolves and foxes. The Carnegie Museum, Pittsburg, has a complete skeleton from Dakota.

Daphne, a famous grove near Antioch, planted by Seleucus Nicator, who erected a temple there and dedicated it to Apollo and Diana. It was a place of pagan pilgrimage noted for its license, until the spread of Christianity caused its abandonment. A graphic description of this grove is given in 'Ben Hur.' For Daphne in Egypt see TAHPANHES.

Daphne, a genus of plants belonging to the *Thymelæaceæ* or mezereon family. The genus has about 40 species, natives of Europe and Asia. The single American species is the spurge or lady laurel (*D. mezereum*), found in northern New England and New York as a fugitive from cultivation. These plants are common in temperate climates in Europe and Asia, and are valuable commercially. From the bast of some species fibres are obtained, and most of the paper used in Central Asia is made from some species of the daphne. The inner bark of *D. lagetta*, when cut into thin pieces after maceration, assumes a beautiful net-like appearance, whence it has received the name of lace-bark. The bark of the spurge-laurel (*D. mezereum*) is used in decoction as a diaphoretic in cutaneous and syphilitic affections.

Daphnepho'ria, one of the most ancient and important of the Greek festivals, observed in honor of Apollo.

Daph'nia, a microscopic crustacean of the order *Cladocera*, encased in a bivalve shell, and found in fresh-water ponds. The species pulex is the common water-flea. The head bears a single compound eye, and a pair of large branching antennæ which act as oars, giving the animal its leaping motion. Its five pairs of feet vibrate constantly to assist respiration.

Daph'nin, a glucoside having the formula $C_{15}H_{16}O_9$, and occurring in the bark and blossoms of certain species of plants belonging to the genus *Daphne*. It is slightly soluble in cold water, from which it crystallizes in rectangular prisms containing two molecules of water. It is insoluble in ether, but readily dissolves in boiling alcohol. It reduces Fehling's solution slowly, and by the action of emulsin or of dilute acids it is converted into glucose and a substance called daphnetin, or di-oxy-coumarin.

Daphnis, in fabulous history, the son of Hermes (Mercury) by a nymph, educated among the nymphs, and celebrated in the Sicilian traditions as the author of bucolic poetry,

and also as a performer on the shepherd's pipe. He pastured his flocks upon Mount Ætna. The nymph Echenais, who loved the youth, threatened him with blindness if he should love another; but being intoxicated with wine by the daughter of a Sicilian prince, he forgot the warning, and thus brought upon himself the threatened punishment. Some say that he died of grief; others that the nymph transformed him into a stone. All the nymphs bewailed his death, and Hermes raised him to the heavens. On the spot where he died flowed a fountain, at which the Sicilians afterward performed yearly sacrifices.

Daphnis (dăf'nĭs) and Chloe, klō'ē, a pastoral romance written in Greek during the 4th or 5th century of our era and ascribed to Longus. Many English, French, and Italian pastorals were suggested by this work; but the one derived most directly from this source is Saint-Pierre's 'Paul and Virginia.' The scene of the Greek tale is laid in the island of Lesbos. A goat-herd named Lamon finds one of his goats suckling a fine baby boy, and adopts him as his own child, calling him Daphnis, and bringing him up to herd his goats. A neighbor, Dryas, discovers a baby girl nourished by a ewe in the grotto of the nymphs. She is adopted under the name of Chloe. The two young people pasture their herds in common, and are bound by a child-like affection, eventually deepening into love. Daphnis sues for the hand of Chloe. He is accepted by her foster-parents; but the marriage is deferred till the arrival of Lamon's master who proves to be the father of Daphnis. Chloe is identified as the daughter of a wealthy Lesbian. The young people are married with great pomp, but return to their pastoral life, in which they find idyllic happiness.

Dapitan, dä-pē'tän, Philippines, a Spanish province or comandancia in the northwestern part of the island of Mindanao. There are numerous rivers navigable for the native boats, and these are the chief means of communication in the province. Hemp, cotton, sugar, etc., are cultivated for domestic consumption; the forests, particularly the ebony, are valuable. There is some export trade in gums, wax, honey, cacao, etc. Pop. 20,270.

Da Ponte, Lorenzo, lō-rĕnd'zō dä pŏn'tĕ, Italian dramatist and author: b. Venice 10 March 1749; d. New York 17 Aug. 1838. He wrote the libretti for Mozart's operas 'Don Giovanni' and 'Figaro.' He came to America in 1805, and in 1828 was professor of Italian in Columbia College. He wrote many plays, sonnets, and translations, and published several works of instruction in the Italian language; also his own 'Life' (1823); 'History of the Florentine Republic and the Medici' (1833).

Darbhangah, dä-bŭn'gä, India, (1) a district in Bengal. In the rainy season the district becomes inundated by the overflow of the rivers Kamlá and Little Bághmati. Area 3,335 square miles; pop. 2,633,477. (2) A town of the same name is the capital of the district. It is situated on the Little Bághmati, and is the residence of the Maharaja of Darbhangah. The chief exports are oil-seeds and timber. Pop. 73,561.

D'Arblay, dăr-blā (Madame), **Frances Burney**, English novelist, daughter of Charles Burney: b. King's Lynn, Norfolk, 13 June 1752; d. Bath, England, 6 Jan. 1840. After she had published 'Evelina, or a Young Lady's Entrance Into the World' (1778), she became the favorite of the literary men of the day, especially Dr. Johnson. Her second novel 'Cecilia' (1782) was no less admired. In 1786 she was made second keeper of the robes to Queen Charlotte, and in 1793 was married to M. D'Arblay, a French army officer. Her other books are 'Camilla' (1795), and 'The Wanderer, or Female Difficulties' (1814). Her 'Diary and Letters,' edited by her niece (1842-6), surpass in modern estimation the rest of her writings. The record begins with 'Evelina.' The success of her first effort, the dinings, winings, and compliments that followed, are recorded with a naïve garrulousness perfectly consistent with simplicity and sincerity. She also wrote memoirs of her father (1832). 'Evelina' and 'Cecilia' were published with introductions by Annie R. Ellis (London 1881-2).

Darboy, Georges, zhŏrzh dăr-bwä, Archbishop of Paris: b. Fayl-Billot, department Haut of the Commune, 16 Jan. 1813; d. Paris 24 May 1871. He was admitted to the priesthood 1836, and began regular parish work; but in 1839 became professor, first of philosophy, then of dogmatic theology in the ecclesiastical seminary of Langres. Removing to Paris in 1846 he was for a while attached to the College of Henry IV. and was also editor of the journal 'Moniteur Catholique'; in 1854 he was appointed vicar-general of the archbishop of Paris and inspector of religious instruction in the schools of the diocese, that is, superintendent of the Christian doctrine work in the diocese. In 1859 he was consecrated bishop of Nancy, and in 1863 was appointed successor to Archbishop Sibour of Paris, who had been slain by an assassin. In the Vatican Council he was one of the leaders of the minority who opposed the declaration of papal infallibility on the ground that such a declaration was inopportune; but after the definition he was one of the first among its former opponents to make submission. In the siege of Paris by the German armies he won universal approval for his devoted labors in relieving the wounded and succoring the distressed; and when the Communists, known to be his mortal foes, came into control of the city, he refused to seek safety outside the walls. Arrested by the Commune and held as a hostage, he with other hostages was fusilladed to death in the yard of the prison of La Roquette, 4 April 1871. The end came while he was in the attitude of blessing his assassins and invoking forgiveness for them. It was not a mere accident or coincidence that he was the author of a 'Life of St. Thomas à Becket' (1859), that archbishop of Canterbury who was slain by assassins before the high altar of his cathedral church 700 years before; within 23 years he had seen his two nearest predecessors, archbishops of Paris, murdered, one by an individual assassin, the other (Affre) by the insurgent populace. In addition to his scholarly work, 'The Life of St. Thomas à Becket,' he wrote a new translation of 'Dionysius the Areopagite,' and also a translation of the 'Imitation of Christ.'

Darby and Joan, the names of a married couple traditionally reported to have lived in the West Riding of Yorkshire in the 18th century and been remarkable for their long and happy life together. A ballad entitled 'The Happy

Old Couple,' by Henry Woodall, commemorates their excellencies. Humdrum, uneventful married life is sometimes referred to as a 'Darby and Joan' existence.

Darbyites, a name often applied to the Plymouth Brethren (q.v.) from their principal founder, John Nelson Darby (1800–82), of whose collected writings 32 volumes have appeared (1867–83). See his 'Personal Recollections' (1881).

Darbyshire, Alfred, English architect: b. Salford, Lancashire, 1839. He began the practice of his profession in 1862 at Manchester and has designed many buildings of importance there and elsewhere. He has published 'Experiences of an Architect, Professional, Artistic, and Theatrical'; 'A Book of Old Manchester and Salford.' He was art critic of the Manchester *Guardian*, 1868–74, and has acted in a similar capacity for the Manchester *Courier* from 1875 to the present.

Darcet, Felix, fālēks dar-sā, French chemist: b. Paris about 1807; d. there 18 Dec. 1846. He was a son of Jean Pierre Darcet (q.v.); studied medicine and became a physician, but paid some attention to chemistry, and published researches on the preparation of hydriodic acid, on the action of iron at a high temperature, on benzoic acid and on camphor, on succinic acid, on arsenovinic acid, on chloretheral.

Darcet, Jean, zhōn, French physician and chemist: b. Donazit 7 Sept. 1725; d. Paris 13 Feb. 1801. He accompanied the celebrated Montesquieu to Paris in 1742, and remained with him till his death as a literary assistant. He afterward devoted himself to chemistry, especially to technical chemistry, was appointed professor of chemistry in the College of France, and regent of the medical faculty. Darcet made many experiments with a view to the improvement of the manufacture of porcelain. He also tried the effect of fire on the various kinds of earths, and demonstrated the volatility of the diamond. In 1776 he published a memoir on the geology of the Pyrenees. He succeeded Macquer as a member of the Academy of Sciences and director of the manufactory of Sèvres. He was afterward appointed inspector-general of the assay of coin and inspector of the Gobelin manufactory. He made several important chemical discoveries, and contributed much to the present improved state of the science. A fusible alloy of lead, bismuth, and tin is named after him.

Darcet, Jean Pierre Joseph, zhōn pē-ār zhō-zef, French chemist: b. Paris 31 Aug. 1777; d. there 2 Aug. 1844. He was a son of Jean Darcet (q.v.). He began his chemical studies early with his father and with Vauquelin. In his 24th year he was made assayer of the mint, and from that time devoted his time chiefly to chemistry in its application to the arts. Being employed by the government in the manufacture of gunpowder, he rendered its preparation much more easy by new processes. He greatly assisted in extending the manufacture of soda artificially, succeeded in producing alum equal in quality to that of Italy, brought the art of stereotyping to greater perfection, facilitated the preparation of sulphuric acid, investigated the best alloys for cannon, for cymbals and tam-tams, and for statues, etc. Among his other discoveries were the extraction of soda from chestnuts, the preparation of sugar from the same material, and the extraction of jelly from bones by means of an acid. He also made another discovery of great importance, whereby he obtained the prize of 3,000 francs which Ravrio had provided for the discovery of the means of protection against the fine dust of quicksilver, which had been so unhealthy to the gilders. Darcet's discovery completely attained the object.

D'Arcy, Ella, English novelist: b. London. She was educated in France and Germany and has published: 'Monochromes' (1895); 'The Bishop's Dilemma' (1898); 'Modern Instances' (1898).

Dardanelles, dar-da-nelz' (ancient Hellespont), a narrow channel, in the Turkish dominions, which connects the Sea of Marmora with the Ægean Sea, and separates Europe from Asia. It is about 40 miles in length, varying in breadth from one to four miles. There is always a rapid current in the channel, the volume and velocity of which is much increased by the prevailing winds, which blow in the same direction with the stream for at least 10 months in the year. The modern name of this strait is derived from the castles, called the Dardanelles, built on its banks, at its southwest entrance; its ancient name, Hellespont, from Helle, daughter of Athamas, king of Thebes, who was fabled to have been drowned in it. Xerxes on his great expedition against Greece, in 480 B.C., crossed this strait by means of two bridges of boats, constructed in the neighborhood of Sestos and Abydos. It is also renowned as the scene of the death of Leander, who, it is said, used to swim across from Abydos on the Asiatic side, at the narrowest part of the strait (but yet about a mile in width), to visit Hero of Sestos on the European side. This feat of swimming the channel was also performed by Lord Byron, who achieved it in 1 hour and 10 minutes. To protect Constantinople, coast batteries have been built since 1807, on both the Asiatic and the European side. These batteries have latterly been supplied, in part at least, with ordnance of recent type, such as the guns made by Krupp. In 1770 the Turkish defenses were almost in ruins. Warned by the condition of the batteries when a Russian squadron appeared before the castles, the Turkish government ordered the defenses repaired; but they were again allowed to become almost useless until 1807. In that year a British squadron passed the Dardenelles and appeared before Constantinople, which until then had never seen an enemy's fleet. In 1854, during the Crimean war, the castles and other defenses of Constantinople were again put in repair. It had long been recognized that the Turks had a right to prevent any foreign ship of war from passing the Dardanelles, and in 1841 a treaty was signed between the five great European powers and the Porte, in which it was laid down that this was not to be permitted. The treaty was confirmed in 1856, the Sultan, however, retaining the right to permit certain vessels belonging to foreign governments to pass. By the Berlin treaty of 1878 the duty was again imposed upon the Sultan to prevent the passage of any foreign ship of war.

Dardanus, där'da-nŭs, in mythology, the progenitor of the Trojans, and so of the

Romans, and the son of Zeus and Electra, the daughter of Atlas. He emigrated from Samothrace (according to some accounts, from Arcadia, or Crete), and settled in Phrygia in the country which was afterward called Troas. Here he built a city, which from him, was called Dardanum, or Dardanus, and introduced the worship of Athena (Minerva).

Dardistan där-dĭs-tän', the name given to a region of central Asia, bordering on Baltistan, the northwest portion of Cashmere. This country, which consists of lofty mountains, is little known, and its limits are variously given; but its interest depends mainly on the fact that its inhabitants, the Dards, are an Aryan people, speaking a Sanskritic tongue mixed with Persian words. They have been called "Stray Aryans in Tibet," and are Moslems converted from Buddhism at a comparatively recent period. The rajah of Cashmere is constantly endeavoring to subject them completely to his authority. The chief districts are Hasora, Gilghit, and Tassin; some authorities also include Chitral in Dardistan.

Dare, Virginia, first child of English parents in the New World: b. Roanoke August 1587, and named after the district of Virginia. She was the granddaughter of John White, who was governor of the colony sent by Sir Walter Raleigh to found an agricultural state, which sailed from Plymouth, 26 April 1587, and reached the shores of Virginia in July of the same year. White's daughter was married to Mr. Dare, who was one of the assistants of the governor, and Virginia was born about a month after the arrival of the expedition.

Darfur, där'foor, or **Darfoor** (Country of the Fur, a tribe of negroes), a region of central Africa, occupying a large portion of the area between Abyssinia and Bornou, and forming part of the Egyptian Sudan. It may be considered as lying between lat. 10° and 16° N., and lon. 22° and 28° E.; area, 150,000 square miles. On the east it has Kordofan; on the west, Wadai; on the north, the desert; while the regions to the south are occupied by barbarous nations. The most important physical feature is the Djebel Marrah, a chain of mountains near the centre of the country, of a crescent form, lying north and south and reaching the height of 6,000 feet. Some of the peaks are extinct volcanoes. There are other subordinate chains and elevated masses. There seem to be no permanent streams, the water-courses being filled only temporarily. The country belongs mainly to the Nile basin, partly to that of Lake Chad. Large portions of it are barren or are covered with verdure only in the rainy season. The inhabitants are of various races, some of them of the negro type, others having little of the negro character, and a considerable number being Arabs. The Fur or For, who give name to the country, inhabit the mountainous central parts, and are of a brownish-black color with negro features. Mohammedanism is the religion of the country, and to it is due what little civilization the people possess; but the natives are still semi-barbarous. Their occupation is chiefly agriculture. A few of the mechanical arts are carried on, and in particular the people manufacture a considerable variety of articles, including cotton goods, pottery, leather, lance-heads, etc. Their houses are rudely constructed of clay and reeds, and with scanty accommodation. Among the exports the most important are camels, ivory, the horns, teeth, and hide of the rhinoceros and hippopotamus, ostrich feathers, gum, and copper. The imports comprise beads, glass, arms, light cloths of different kinds, silks, shoes, and other manufactured articles. Darfur was an independent kingdom till annexed by Egypt in 1874. During the ascendency of the Mahdi and his successor it was independent; but it is now recognized as within the "sphere of influence" of Great Britain. The capital is El Fâsher. Pop. 4,000,000.

D'Argenson, Marc Pierre, märc pē-ār' därzhăñ-sôñ, **Comte,** French statesman: b. 1696; d. Paris 1764. He was the younger son of the Marquis d'Argenson (1652–1721), who created the secret police and established the *lettres de cachet*. He became war minister in 1743, at a time when the very political existence of France was imperiled, and by his vigor and lucky choice of generals changed the fortunes of the war in the course of a single year. After the peace of Aix-la-Chapelle (1748), he devoted himself to the improvement of the military system, and in 1751 established the Ecole Militaire. He was an illustrious patron of literature. Diderot and D'Alembert dedicated to him their great 'Encyclopédie'; and to Voltaire, whose fellow-student he had been, he furnished materials for his 'Siècle de Louis XIV.' In 1757 he was banished to his estate by the machinations of Madame Pompadour; but on her death he returned to Paris.

Dargomyzhsky, där-gō-mĭzh'skē, or **Dargomijsky, Alexander Sergievitch,** Russian composer: b. village of government of Toula, 2 Feb. 1813; d. St. Petersburg 29 Jan. 1869. He composed the music for the libretto of 'Esmeralda,' which Victor Hugo wrote for Louise Bertin, many piano pieces, 100 romances, airs, and duets for the voice, symphonic and choral fantasies and a "cantata-ballet," called 'The Festival of Bacchus,' besides the opera of 'La Roussalka,' his happiest effort, given at St. Petersburg in 1856. After this he tried to form a new school, dying before the completion of his opera, 'The Guest of Peter,' which was finished by friends and given in 1872 without much success.

Daric, dăr'ĭk, properly **Daricus** (Gr. *δαρεικός*), an ancient Persian coin of pure gold, specimens of which are still preserved in several European collections, bearing on one side the image of a kneeling archer, on the other that of a royal palla. It was known to the Greeks, Romans, and Jews; the latter used it after the Babylonian captivity, under the reign of the Persians, and called it *adarkon* or *darkemon* (mentioned in the first book of Chronicles, by Esdras and Nehemiah). Its value was equal to 20 silver drachmæ, or 16 shillings 3 pence; 3,000 being equal (according to Xenophon) to 10 talents. Its name is variously derived from that of King Darius Hystaspes, who regulated the Persian currency, and from several Persian words meaning king, palace, and bow. The so-called silver darics were not designated by this name in antiquity.

Darien, dā'rĭ-ĕn, Ga., city, county-seat of McIntosh County: on the Altamaha River, and the Darien & Western Railroad; about 65 miles southwest of Savannah, and about 10 miles

from the ocean. Lumber, rice, and vegetables are sent from here to the markets along the coast. Pop. 2,000.

Darien, dă'rĭ-ĕn, Sp. dä-rē-ān', **The Colony of,** established by the Spaniards on the Gulf of Uraba (See GULF OF DARIEN), in the first decade of the 16th century, was the centre from which exploring expeditions were sent out until Panama was founded in 1519. A notary of Uraba, named Bastidas, sailed along the Caribbean coast of the isthmus in 1501, Balboa being one of his companions. At the end of 1502 and beginning of 1503 Columbus carefully examined the region immediately west of this gulf. In 1508 the king granted to Nicuesa the territory from the Gulf of Darien to Cape Gracias a Dios; to Ojeda, the territory from the Gulf of Darien to Cape de la Vela. The dividing line was more precisely fixed by the grantees, who agreed that it should be the Atrato River. (See DARIEN, GULF OF.) In the event the only permanent settlements were made near this river and the gulf into which it flows. Ojeda first landed at Cartagena (1509), where his expedition endured great hardships. Removing thence to the eastern side of the Gulf of Urabá, he built the fort called San Sebastian, which he entrusted to Francisco Pizarro, and then returned to the West Indies. Pizarro, Balboa, and all who remained alive set sail for Cartagena once more. There they were met by Enciso, with re-enforcements from San Domingo, and after some hesitation, crossed the gulf to the western shore, where the colony of Santa Maria de la Antigua del Darien was established in 1510. Balboa gained ascendency by recommending the selection of this place (which he had visited with Bastidas), and became the leading spirit in the undertakings which followed — the expedition to Dabaiba, the crossing of the isthmus, etc. (see BALBOA).

Nicuesa's expedition, though it started under brighter auspices, resulted in a lamentable failure. Its courtly leader, after losing nearly all his followers near Cape Nombre de Dios, was forced to put to sea in a boat that could not outlive a single storm — practically condemned to death by the authorities at Darien, whom he had offended. In 1514 Pedrarias Davila superseded Balboa as governor. Five years later Panamá was founded; the capital was established on the Pacific coast; exploration northward and southward began along the shores of the newly discovered ocean; the isthmian traffic sought and found an easier route, better harbors, and a less deadly climate at a distance from the Gulf of Urabá. Darien was abandoned. See CENTRAL AMERICA; SOUTH AMERICA.

Darien, Gulf of, also called **The Gulf of Urabá,** an extension of the Caribbean Sea forming a wedge-shaped indentation in the northern coast of Colombia; of great width between Colón and Cartagena, but narrowing toward the south until it becomes an estuary of the Atrato River. A distinction to be commended on the ground of convenience is that which would restrict the name Urabá to the southern portion, which is about 7 miles wide by 30 long. Some of the earliest Spanish settlements, at the beginning of the 16th century, were located on the Gulf of Urabá (see DARIEN, THE COLONY OF); the region has not prospered, however, owing to the lack of good harbors; to the extremely unhealthful, hot, and damp climate of the coast at this point; and the diversion of isthmian traffic to Colon and Parana.

Darien, Isthmus of, the neck of land uniting South and Central America; more specifically, the lower portion which is narrowed between the gulfs of Urabá and San Miguel, while its prolongation on the northwest, between the Caribbean Sea and the Gulf of Panamá, is called the Isthmus of Panamá. It is traversed by the Cordillera de Baudó. Its principal rivers are the Tuira (also called Darien), which rises in the heights of Aspaves, receives the waters of a number of tributaries, and flows into the Gulf of San Miguel, and the Atrato, which comes out of the department of Cauca and empties into the Gulf of Urabá. In regard to the climate on the coast, see DARIEN, GULF OF. A Colombian official publication says: "The interior of the Isthmus of Darien is very sickly, and only the negroes and Indian half-breeds can stand its excessively rainy climate, hot and damp, and its atmosphere, which the marshes make malarious. Though about the Darien cordillera the temperature is milder, it cannot be said that the region is salubrious; and it will never be until the great woods and groves shall have disappeared." The woods in question, especially in South Darien, are of excellent quality and colossal growth, constituting a source of wealth. Gold is obtained from the rivers Balsas and Marea, and the mines of Cana or Espiritu Santo, near the Tuira River, were famous in the old days. For other natural resources, etc., see PANAMÁ, DEPARTMENT OF; for historical sketch, see DARIEN, THE COLONY.

Darien River, the name sometimes given to two streams in the Republic of Colombia: (1) A river emptying into the Gulf of Urabá, on the banks of which Balboa and others founded in 1510 the town of Antigua del Darien (see DARIEN, THE COLONY); (2) the Tuira River (see DARIEN, ISTHMUS OF).

Darien Scheme, a celebrated financial project, conceived and set afloat by William Paterson, a Scotchman, toward the close of the 17th century. It is said that he was originally a buccaneer, that he was a clergyman, and that he was a merchant; the probabilities are on the side of the last assertion, as he possessed a wide knowledge of commerce and finance. He was undoubtedly a man of an original mind, and of a bold and enterprising disposition. He was the first projector of the Bank of England, and being defrauded of his just recompense by those who adopted his plans, he resolved to confine his future schemes to the benefit of his native country. On his original and ostensible design of establishing an East India trade in Scotland, he ingrafted the secret and magnificent plan of forming an emporium on each side of the Isthmus of Darien or Panama, for the trade of the opposite continents. According to his idea, the manufactures of Europe were to be sent to the Gulf of Darien, and thence conveyed by land across the ridge of mountains that intersect the isthmus, where they were to be exchanged for the produce of South America and of Asia; and thus, to use his own emphatic language, he would wrest the keys of the world from Spain. In order to attract encouragement and support, he proposed to render his settlement a free port,

and to banish all distinction of party, religion, or nation. But Scotland was at this time very poor; and Paterson went to London to procure subscriptions, which soon ran up to the amount of $1,500,000. But alarm, first excited by the East India Company and the West India merchants, soon spread over the whole English nation. Even the Parliament addressed King William, in an address remarkable for narrow and illiberal views; and the king, who could ill afford to quarrel with both the English houses of Parliament, nor compromise himself at this juncture with Spain, replied to the address in terms which were interpreted as disfavorable to the scheme, and the English subscriptions were withdrawn. But Paterson himself was not to be easily intimidated; and Scotland, indignant at the opposition which the plan had met with in England, avowedly because it would be beneficial to the Scotch, immediately subscribed $2,000,000, although at that time there was not above $4,000,000 of cash in the kingdom. Only a little more than the half of the subscriptions, however, was ever paid up. Such was the national enthusiasm, that young women threw their little fortunes into the stock, and widows sold their jointures to get the command of money for the same purpose. Besides this sum, $1,500,000 was subscribed at Hamburg, which, however, was withdrawn, in consequence of the threatening memorial presented by the English resident to the senate of that city. The Scotch, nevertheless, persisted in their scheme: five large vessels, laden with merchandise, military stores, and provisions, with a colony of 1,200 persons, sailed for the Isthmus of Darien, which they reached after a voyage of about four months.

The settlement was very judiciously formed at Acta, a place at an equal distance between Porto Bello and Cartagena. Here is a secure and capacious harbor, formed by a peninsula, which the colonists fortified and named Fort St. Andrew. To the settlement they gave the name of New Caledonia. Of the 1,200 persons who had embarked 300 were gentlemen, unaccustomed to labor, fatigue, or homely fare, and totally unacquainted with any of those arts which are indispensably necessary in a new colony. These consequently were of little use; and even the peasants, habituated to a cold climate, were unequal to the fatigue of clearing the ground under a burning tropical sun. In addition to these untoward circumstances, their provisions were either improper for the climate or soon exhausted. The cargoes of merchandise which they sent to the West India islands were not properly adapted for that market. The infant colony was attacked by the Spaniards, and proclamations were issued at Jamaica, Barbadoes, and in the American plantations, prohibiting all succor or access to the Scotch at Darien, on the pretense that their settlement there was an infringement of the alliance between England and Spain. For eight months the colony bore up against these accumulated misfortunes and persecutions; but at the end of this period those who survived were compelled, by disease and famine, to abandon their settlement and return to Europe.

Before this circumstance was known, two other expeditions sailed from Scotland; and the information of the abandonment of the first colony only served to arouse the Scotch nation to more determined perseverance in the plan. When the second expedition arrived, they found the huts burned and the forts demolished; famine and disease assailed them; they were attacked by the Spaniards from Panama, these they repulsed; but a larger force coming from Cartagena obliged them to capitulate, on condition that they should embark with their effects for Europe; few, however, of these or the other two colonies survived to return to Scotland.

The people of Scotland were indignant at this utter and irremediable failure. They endeavored to extort from William an acknowledgment of the national right to Darien; and failing in this, they presented an address to him to assemble the Scotch Parliament; when it did assemble, a resolution to assert the national right to their colony was only prevented by adjournment, and ultimately by proroguing the Parliament; it was, however, soon necessary to reassemble and mollify it in order to get the supplies for the army; and when it did meet again, some very popular and spirited resolutions were adopted on this subject. The Scotch nation were never afterward thoroughly reconciled to King William, and even for many years subsequent to his death, the remembrance of the loss of Darien was preserved with resentment and regret. In this scheme many families were reduced to ruin, and few had escaped without the loss of a relative or friend. Paterson, on his passage home, after the ruin of the first colony, was seized with lunacy, from which, however, he recovered. He lived many years after, pitied, respected, and neglected. In order to pave the way for a better understanding between the two countries, the lords commissioners for England agreed in 1706 to purchase the shares of the particular members of the Darien Company. A full account of the Darien expedition is to be found in the second volume of Sir John Dalrymple's 'Memoirs of Great Britain and Ireland.' The best recent authority on the subject is John Hill Burton (see his 'History of Scotland' and his 'Darien Papers'). See also Sir Walter Scott's 'Tales of a Grandfather' for a most interesting but rather one-sided narrative.

Da Rimini, Francesca, frän-chĕs'kä dä-rē'mē-nē, an Italian lady of the 13th century, the daughter of Guido da Polenta of Ravenna. She was married to Giovanni Malatesta da Rimini, a cripple, but loved his brother Paolo. Giovanni surprised the lovers at one of their meetings, and killed them both (about 1285). Their story is told in Dante's 'Inferno,' and is the subject of Leigh Hunt's poem, 'The Story of Rimini,' and of the dramas, 'Francesca da Rimini,' by D'Annunzio, and 'Paolo and Francesca,' by Stephen Phillips.

Darius, da-rī'ŭs, the name of several Persian kings, or, according to some writers, the royal title itself. Among the most distinguished individuals of this name are:

1. DARIUS, fourth king of Persia, d. 485 B.C. He joined the conspiracy against the False Smerdis, who had possessed himself of the Persian throne. After the conspirators had succeeded in getting rid of the usurper, they agreed to meet early the next morning, on horseback, and to appoint him king whose horse should neigh first after sunrise. The groom of Darius, apprised of this project, led his master's horse in the night with a mare to the appointed place, and, in consequence of this stratagem, the horse

of Darius neighed first the next morning. Darius was therefore saluted king, and the nation approved the choice. His reign was marked by many important events. The city of Babylon revolted, partly on account of burdensome impositions of tribute, and partly because the royal residence, under Cyrus, had been transferred thence to Susa. Darius besieged the city nearly two years without success, and was on the point of abandoning the siege when Zopyrus, one of his generals, by a heroic sacrifice placed the city in his possession. After the suppression of Babylon Darius undertook an expedition, with an army of 700,000 men, against the Scythians on the Danube, who enticed him so far into their inhospitable country by their pretended flight, that he succeeded with difficulty in extricating himself and his army, after suffering great losses. Leaving a part of his forces under the command of Megabyzus in Thrace, to conquer that country and Macedonia, he returned with the remainder to Asia, to recruit at Sardis. In the year 501 B.C. a disturbance at Naxos, in which the Persians had taken part, occasioned a revolt of the Ionian cities, which the Athenians endeavored to promote, but which was suppressed by the capture and punishment of Miletus in 496. To revenge himself upon the Athenians, Darius sent Mardonius with an army, by the way of Thrace and Macedonia, against Greece, and prepared a fleet to make a descent upon its coasts. But his ships were scattered and destroyed by a storm in doubling Mount Athos, and the army was almost entirely cut to pieces by the Thracians. Darius, however, collected another army of 500,000 men, and fitted out a second fleet of 600 ships. Naxos was conquered, and Eretria, in Eubœa, sacked. Thence the army under Datis and Artaphernes proceeded to Attica, and was led by Hippias to the plains of Marathon. The Athenians had in vain besought assistance from their neighbors, and were obliged to depend upon their own resources alone. They marched forth, 10,000 strong, under the command of Miltiades, to meet the Persian army, and animated by the reflection that they were fighting for freedom and their country, obtained a complete victory (490 B.C.). This prince did much to improve the internal administration of his kingdom. In the year 508 B.C. he sent his admiral, Scylax, to explore the river Indus, and he encouraged commerce and arts by useful institutions and laws.

2. Darius II., king of Persia (surnamed Nothos, or the Bastard, by the Greeks): d. 404 B.C. He was an illegitimate son of Artaxerxes I. (Longimanus). He ascended the throne in 423, and suppressed several rebellions of his satraps; but Amyrtæus succeeded in maintaining himself in independent possession of Egypt, which had revolted in 414. His son Cyrus is familiar to us through Xenophon's 'Anabasis.'

3. Darius III., king of Persia (surnamed Codomannus). He was the great-grandson of Darius II., and the 12th and last king of Persia. He ascended the throne 336 B.C., when the kingdom had been weakened by luxury and the tyranny of the satraps under his predecessors, and could not resist the attacks of a powerful invader. Such was Alexander of Macedon; and the army sent against him by Darius was totally routed on the banks of the Granicus, in Asia Minor. Darius then advanced with 400,000 soldiers, to the plains of Mesopotamia. The Grecian mercenaries advised him to await the enemy here, as the level country would enable him to draw out his outforces to advantage; but Darius hastened forward to meet Alexander in the mountainous Cilicia. Darius was a second time totally routed, near the Issus 333 B.C. He himself escaped, under cover of the night, to the mountains. His mother, his wife, and three of his children fell into the hands of the conqueror, who treated them with great generosity. Darius was so far from being discouraged by these defeats that he wrote a haughty letter to Alexander, in which he offered him a ransom for the prisoners, and invited him to a new engagement, or, if he did not choose that, granted him permission to retire into Macedonia. Alexander then laid siege to Tyre, on which Darius wrote him another letter, offering him not only the title of king, which he had before refused to do, but also 10,000 talents ransom, and all the countries of Asia as far as the Euphrates, together with his daughter, Statira, in marriage. These propositions, however, were unavailing. Alexander subjected Egypt, and the two armies met between Arbela and Gaugamela, and after a bloody engagement Darius was compelled to seek safety in flight (331 B.C.). Alexander took possession of his capital, Susa, captured Persepolis, and reduced all Persia. Darius fled to the northern provinces, where he was seized by Bessus, one of his satraps, and afterward murdered.

Darjeeling, där-jēl'ing, **Darjiling**, or **Dorjilling** (the diamond thunderbolt land), (1) a district of India, in the extreme north of the province of Bengal; area 1,234 square miles. It lies on the southern slope of the Himalayas, and consists partly of mountain and valley, partly of a *terai* or marshy strip below the mountains, some of which are over 10,000 feet high. Coffee, cinchona, rice, and cotton are raised, and the cultivation of the tea-plant is rapidly extending; about 65,000 acres are now in tea plantations. Pop. (1891) 233,314. (2) The chief town in this district is Darjeeling, a celebrated sanatory station, and for several months of the year the residence of the lieutenant-governor and his staff. The Darjeeling & Himalayan Railroad connects it with Calcutta. Pop. 13,037.

Dark Ages, The, a period supposed to extend from the fall of the Roman empire, 475 A.D., to the revival of literature on the discovery of the Pandects at Amalfi in 1137. Not to draw the limits too finely, say 700 years (450 to 1150). The Middle Ages may be extended to about 1550, covering from 10 to 11 centuries.

Dark and Bloody Ground, The, a name frequently applied to the State of Kentucky. It is said to be a translation of the Indian words "Kain-tuk-ee," though some authorities claim that they signify "At the head of the river." The epithet was originally bestowed because the region was the scene of many sanguinary conflicts between the redmen of the northern and southern tribes. Later the constant feuds between white settlers and the aborigines rendered the phrase peculiarly appropriate to this locality.

Dark Continent, The, Africa, in allusion to the almost total ignorance concerning the people and geography of its interior which until quite recently prevailed in Europe and America. See Africa.



DARJEELING, INDIA, SHOWING THE HIMALAYA MOUNTAINS.

Dark Day, a name frequently used in this country in connection with 12 May 1780, but applied also to days on which similar phenomena have been discerned. On the date mentioned the atmosphere in New England was so obscured as to cause in some places cessation from outdoor labor. Birds and domestic fowls acted as during an eclipse. The darkness began at 10 and lasted until night, causing a feeling of alarm by its unprecedented nature. There appears to have been an absence of clouds for the most part, though light rain occurred. Though known as the Black Friday of New England, the area covered by darkness also extended west of that section.

Two dark days are recorded as occurring in America earlier than the Black Friday, one in 1716 and another in 1762. The Dark Days of Canada were 16 Oct. 1785 and 3 July 1814. On the latter date the darkness extended over a tract estimated to be about 300 miles in length and 200 in breath, in the region of the Saint Lawrence River and Gulf. There were showers of sand and very dark ashes and the atmosphere was of a deep yellow color. The characteristic features seemed to point to volcanic action as an origin rather than to forest fires. These two causes have in recent years received much attention in their relation to the obscuring and tinting of the atmosphere over immense areas. The smoke from great forest fires in the northwestern States and in Canada was in 1881 carried south or southeast to almost incredible distances and in June 1903 extensive fires in the forests of New England and of the Adirondacks caused a yellowish haze that extended far from its source. After the volcanic eruptions of Mount Soufrière and Mount Pelée in May 1902 vast quantities of volcanic dust were borne seaward, more or less obscuring the daylight by their persistence in the atmosphere. The volcanic dust from Krakatoa is believed to have encircled the entire earth and to have affected the color of the atmosphere for months. In countries situated like Egypt a marked obscuration of daylight may often be accounted for by the fine sand brought by winds from the desert.

Dark Horse, a phrase used in racing concerning a horse when its power of performance or chances of success are not generally known. The expression has been transferred to fields of human competition, and is frequently used in politics, especially in reference to candidates for nomination in a convention, when they are unexpectedly brought forward or draw a following that had not been anticipated.

Darke, William, American soldier: b. Pennsylvania 1736; d. Jefferson County, Va., 26 Nov. 1801. At 19 he served with the Virginians in the battle of Braddock's defeat, and afterward in the war of the American Revolution. At Saint Clair's defeat he commanded the left wing of the army, and made two gallant and successful charges with the bayonet, in the second of which his youngest son, Capt. Joseph Darke, fell mortally wounded (4 Nov. 1791). His father paused but a moment over him, and rushed with redoubled energy into the conflict. He was repeatedly a member of the Virginia legislature, and, as member of the convention of 1788, voted for the Federal Constitution.

Dar'laston, England, town in Staffordshire, included in the parliamentary borough of Wednesbury. It is an irregular, straggling place, engaged in the manufacture of iron for bridges, roofing, and railroads, and gun-locks, bolts, bars, screws, etc. Pop. (1901) 15,391.

Darley, Felix Octavius Carr, American artist: b. Philadelphia, Pa., 23 June 1822; d. Claymont, Del., 27 March 1888. His illustrations of literary masterpieces gave pleasure to thousands, and made him famous. His best work comprises his drawings to accompany the text of 'Rip Van Winkle'; 'Sleepy Hollow'; 'Courtship of Miles Standish'; 'Scarlet Letter'; 'Evangeline'; the novels of Cooper, Dickens, and others, besides many special pictures. His book 'Sketches Abroad with Pen and Pencil' (1868) is well known.

Darley, George, English poet: b. Dublin 1785; d. London 1849. He was graduated at Trinity College, Dublin, in 1811, went to London in 1825, and became attached to the 'Literary Gazette' and 'Athenæum' journals, in which his criticisms of poetry and the fine arts made him well known. He is the author of the 'Labors of Idleness'; 'Sylvia' (1822), and miscellaneous works of a mingled philosophical and poetic character.

Darling, Flora Adams, American novelist: b. Lancaster, N. H., 1840. She married Edward Darling, a Confederate officer, killed in the Civil War. She was one of the founders of the society of Daughters of the Revolution and has been prominent in that and other patriotic organizations. She has published: 'A Wayward, Winning Woman' (1890); 'Was it a Just Verdict?' (1890); 'The Bourbon Lily'; 'Mrs. Darling's Letters, or Memories of the War' (1894); 'A Social Diplomat' (1898); 'History D. A. R. and D. R. Societies of Patriotic Organizations' (1901); 'The Senator's Daughter,' etc.

Darling, Grace Horsley, English heroine: b. Bamborough, England, 24 Nov. 1815; d. 20 Oct. 1842. She was the daughter of the keeper of the Longstone Lighthouse. The event which made her famous occurred on 6 Sept. 1838. The steamer Forfarshire was wrecked near the lighthouse, and at daylight William Darling descried the wreck from Longstone, but accustomed to scenes of danger as he was, shrank from attempting to reach the wreck through a boiling sea in a boat. His daughter, who could see, by the aid of a glass, the sufferers clinging to the wreck, implored him to let her accompany him in the endeavor to relieve them. At last he consented; and father and daughter reached the wreck, and found nine sufferers, whom they succeeded in bringing to the lighthouse. The news of the heroic deed soon spread, and a purse of $3,500 was quickly subscribed and presented to the brave girl.

Darling (so called from a governor of New South Wales), a name of several applications in Australia (1) The Darling River, a river rising in the northeast of New South Wales, is formed by the junction of several streams, and flows in a southwesterly and southerly direction till it joins the Murray at Wentworth. (2) Darling district is a pastoral district about 50,000 square miles in extent, in the southwest of New South Wales, and watered

by the Darling and the Murray. (3) The Darling Downs are a rich table-land west of Brisbane, in Queensland, forming excellent pasture and arable land. It is well watered, and comprises about 6,000 square miles. (4) The Darling Range, granite mountains in western Australia, ranging in a northerly direction parallel with the coast from Point D'Entrecasteaux for nearly 200 miles. Its highest peaks do not exceed 1,500 feet in height.

Darlington, William, American botanist: b. Farmingham, Pa., 28 April 1782; d. Westchester, Pa., 23 April 1863. He was a soldier in the War of 1812, and a member of Congress 1815–17, and 1819–23. He published a descriptive catalogue of plants in Pennsylvania: 'Flora Cestrica' (1837–53); 'Mutual Influence of Habits and Disease' (1804); 'Agricultural Botany' (1847); and in 1853 a genus of pitcher-plant found in California was named in his honor, *Darlingtonia Californica.*

Darlington, England, a municipal and parliamentary borough in Durham County. It is well built, chiefly of brick, and nearly in the form of a square, and has among its public buildings an ancient Gothic church with a lofty spire, founded in 1160, restored in 1805; corporation buildings, with a handsome clock-tower; market-house, hospital, an infirmary, a technical college, mechanics' institute and library, a grammar-school, a girls' training college, etc. A free library was established in 1885. The woolen manufacture is carried on to a considerable extent, and there are large manufactories of iron, steel, locomotives, materials for bridges and railroads. The town is on the Stockton & Darlington Railroad (now part of the North Eastern system) which was the first line in England on which locomotive steam-engines were used. Pop. (1901) 44,460.

Darlington, S. C., town, county-seat of Darlington County, on the Atlantic Coast Line Railroad, about 80 miles northeast of Columbia. It is in an agricultural region, and is a trade centre for tobacco, cotton, corn, and other products. The manufactures are chiefly cotton goods, tobacco, and fertilizers. Pop. (1902) 3,652.

Darlingto'nia, a genus of pitcher-plants, belonging to the order *Sarraceniacæ* (sarracenials). The *D. californica* grows in the northern part of California, chiefly in the district around Mount Shasta. It is found in boggy places on the slopes of mountains. It entraps insects, which are attracted to the curious pitcher or hood at the extremity of the tubular leaves; and, once inside, are prevented by the fine hairs which point downward from returning. Sometimes the leaf-stems at their base are filled to the depth of four or five inches with insect remains. The larva of a small moth *Xanthoptera semicrocea*, preys on the plant, and that of a dipterous insect, *Sarcophaga sarraceniæ*, feeds on the dead insects which it encloses. See CARNIVOROUS PLANTS.

Darmestet'er, Agnes Mary Frances Robinson, English poet: b. Leamington, England, 27 Feb. 1857. She has attained great proficiency in Greek studies, her verse showing the influence of Hellenic literature. In 1888 she married James Darmesteter (q.v.), the Orientalist, who died in 1894, and in 1901 she married Emile Duclaux, director of the Pasteur Institute in Paris. Her writings include: 'A Handful of Honeysuckle' (1878); 'The Crowned Hippolytus, from Euripides' (1881); 'Arden,' a novel (1883); 'Emily Brontë' (1883); 'The New Arcadia and Other Poems' (1884); 'Margaret of Angouleme, Queen of Navarre' (1885); 'An Italian Garden' (1886); 'The End of the Middle Ages: Essays and Questions in History' (1888); 'Songs, Ballads and a Garden Play' (1888); 'Lyrics' (1891); 'Retrospect' (1893); 'Life of Renan' (1897); 'A Mediæval Garland' (1897); 'Collected Poems' (1901); and in French, 'Marguerites du Temps Passé' (1892); 'Froissart' (1897); 'Grands Ecrivians d' Outremanche' (1901).

Darmesteter, dăr-mē-stē-tăr, **James,** French Orientalist: b. Château-Salins, 28 March 1849; d. Maisons-Lafitte, near Paris, 19 Oct. 1894. Besides works of strict scholarship on the Oriental literatures, as 'Ormazd and Ahriman' (1877); 'Iranian Studies' (1883); 'Origins of Persian Poetry,' he wrote many essays on miscellaneous subjects. There is an English translation of some of his 'Selected Essays.' He translated with Mills the 'Zend-Avesta' for the 'Sacred Books of the East' series, published by the University of Oxford and edited by Max Müller.

Darmstadt, dārm'stät, Germany, capital of the Grand duchy of Hesse, near the Darm River, 15 miles south of Frankfort. It consists of an old and a new town. The former, which is the business part of the town, is very poorly built; the houses are old, and the streets narrow and gloomy. The new town is laid out with great regularity, and has handsome squares and houses. Among the remarkable buildings are the old palace (with a library of 500,000 volumes and 4,000 MSS., a picture gallery, and a rich museum of natural history), the Roman Catholic Church, patterned after the Pantheon, the Stadtkirche, and the Rathhaus, or town-hall, built in 1580. Darmstadt has some iron foundries, breweries, and other manufactures, and its industries are increasing, but it depends more upon the residence of the court than upon either trade or manufactures. It owns its own electric and gas plants, and its schools and charitable institutions are numerous for its population. Justus von Liebig, the scientist, was born here in 1803. Pop. (1900) 72,381.

Dar'nel, the popular name for *Lolium temulentum*, which some suppose to be the *Infelix lolium* of Virgil and the *Zizania* (tares) of Scripture. It is believed by the ancients to be poisonous and narcotic. It is common in waste places and fields in America from New Brunswick to Georgia and northwestward to Michigan. It is remarkably abundant on the Pacific Coast and is generally a troublesome weed. It has been naturalized from Europe.

Darnley, Henry Stuart, Lord, husband of the Scottish queen, Mary Stuart: b. England 1546; d. Edinburgh 10 Feb. 1567. His father, the Earl of Lennox, was descended from a branch of the house of Stuart; his mother, Margaret Douglas, was the daughter of Margaret of England, sister of Henry VIII. Darnley, though devoid of real merit, had, by his personal attractions, won Mary's heart, but it was an unfortunate match; and ere long gave rise first to coolness, then to open quarrel, and finally to deadly hate. Darnley thought, or affected to

think, that her regard for David Rizzio was of a kind which no husband ought to tolerate, and leagued with a body of conspirators, who, on 9 March 1566 dragged Rizzio from the queen's presence, and murdered him under circumstances of horrid barbarity. About the end of that year Darnley was seized with smallpox. In January Mary had him conveyed to an isolated house called Kirk of Field, which stood at some distance from Holyrood. This dwelling, which belonged to a retainer of Bothwell's, the rapidly rising favorite, was blown into the air with gunpowder. The dead bodies of the king and his page were found in a field at a distance of 80 yards from the house, quite free from any mark which such an explosion would cause. Previous to this tragedy a son had been born of the marriage, who afterward united the Scotch and English crowns under the name and title of James I. of England and VI. of Scotland.

Darrow, Clarence S., American lawyer: b. Kinsman, Ohio, 18 April 1857. He was admitted to the bar in 1875, and for some time filled the position of attorney for the Northwestern Railroad Company. He has been very prominent in legal practice, and been retained in many cases against monopoly, as for example in the case against the Gas Trust in Chicago. He is an active politician, being identified with the Independent Democrats. He has written a volume of essays, entitled 'The Persian Pearl,' and many brochures on topics relating to political economy and the social structure.

Dart, a javelin, a short missile weapon thrown by the hand, or impelled by the breath, through a tube. Dart-heads are usually made of iron, but among savage nations flints, sea-shells, fish-bones, and other hard substances have been employed; and among some of the aboriginal inhabitants of the United States and Africa, the dart was merely a sharp-pointed stick, the end of which was carbonized by fire. The weapon is always very simple in its construction, and is usually from three to five feet long.

Darter, a name given to water birds of a small family (*Plotidæ*), found in the southern United States, in Africa, Asia, and Australia. The American species (*Anhinga anhinga*), also called the snake-bird and water-turkey, is especially common in Florida, and extends northward to North Carolina and Illinois. In appearance and habits the darter resembles the cormorant, especially in the structure of the feet, wings, and tail; the bill and neck are like those of the heron, the neck, owing to a peculiar anatomical mechanism, being remarkably flexible. The general color of the body is dark glossy green with silvery gray markings; wings and tail, bluish-black. The tail is rather long and consists of 12 narrowly wedge-shaped quills. Their haunts are in low swampy localities, by the side of murky streams. They generally perch on trees whose branches dip into the water. They are the best fresh-water divers known, and drop into the water with such surprising skill that the large body makes scarcely any noise, and but little ripple on entering the water. When swimming, its body is submerged, and the only part visible is the long neck, writhing about like an aquatic serpent, from which peculiarity its name of snake-bird. Its food consists of small fish, shrimps, young reptiles, leeches, etc. The quantity of fish it can consume is enormous; but like other bird feeding on fish and flesh, it can remain several days without food with impunity. It captures fish, not by diving upon them from above, but by pursuing them under water and spearing them with its closed beak. A bulky nest of sticks, roots, etc., is placed in a tree and receives three or four white chalky eggs.

Darters, small fresh-water fishes forming a sub-family of the *Percidæ* (q.v.), from the typical members of which they are distinguished by having the pseudobranchiæ (opercular gills) imperfect or absent, the margin of the gill-cover smooth, the skull less perfectly ossified, etc. They have been described as perches reduced in size and compacted. The *Etheostomatinæ* are peculiar to North America, where 15 genera and about 80 species occur, mostly in rocky rills and clear mountain brooks too small to be occupied by other fishes. They are among the smallest of fishes, some of the species being less than two inches, and the largest — the so-called log-perch (*Percina caprodes*) of the Great Lake region and Mississippi Valley, only six to eight inches long. The typical and largest genus is *Etheostoma*.

The darters spend most of their time resting on their fins on the bottom, hiding beneath stones, or burying themselves in the sand, leaving only the eyes uncovered. Owing to the protective resemblance of their markings to the bottom, they are difficult to distinguish. When disturbed, most of the species dart for a short distance with the greatest rapidity, and again settle on the bottom in a quiescent state. These little fishes are among the most interesting inhabitants of our fresh waters, and a valuable account of their habits will be found in a paper by Jordan and Copeland in the 'American Naturalist' for 1876.

Dartford, England, a market-town of Kent, in the narrow valley of the Darent River, two miles above its entrance into the Thames, and 17 miles east southeast of London. Edward III. here founded an Augustinian nunnery (1355); St. Edmund's chantry was a great place of pilgrimage; and at Dartford, Wat Tyler began his rebellion (1381). Spielman built here the first paper-mill in England (1590). There is considerable manufacturing, chief of which are the cotton goods, powder, paper, and corn meal, iron and iron products, oil, and chemicals. Pop. (1902) 18,965.

Dart'moor, an extensive, rugged, mountainous tract in England, in the western part of Devonshire, often called the "Forest of Dartmoor," but at present having no appearance of a forest, except what is afforded by some dwarf oaks, intermixed with ash and willow; reaching from Brent south to Oakhampton north, 22 miles, with a breadth of about 20 miles, and occupying from 130,000 to 150,000 acres. In the centre of the moor there is an extensive swamp in which the rivers Dart, Teign, Taw, Yealm, Erme, and a great number of smaller streams have their source. Cattle and sheep are fed on the coarse grass during the summer months. In the winter the storms from the Atlantic sweep over it, and it would be difficult to imagine a more desolate-looking place. Several of the rugged granite hills (here called "tors") are of considerable height, Yes Tor rising 2,050 feet above the plain. The district is noted as

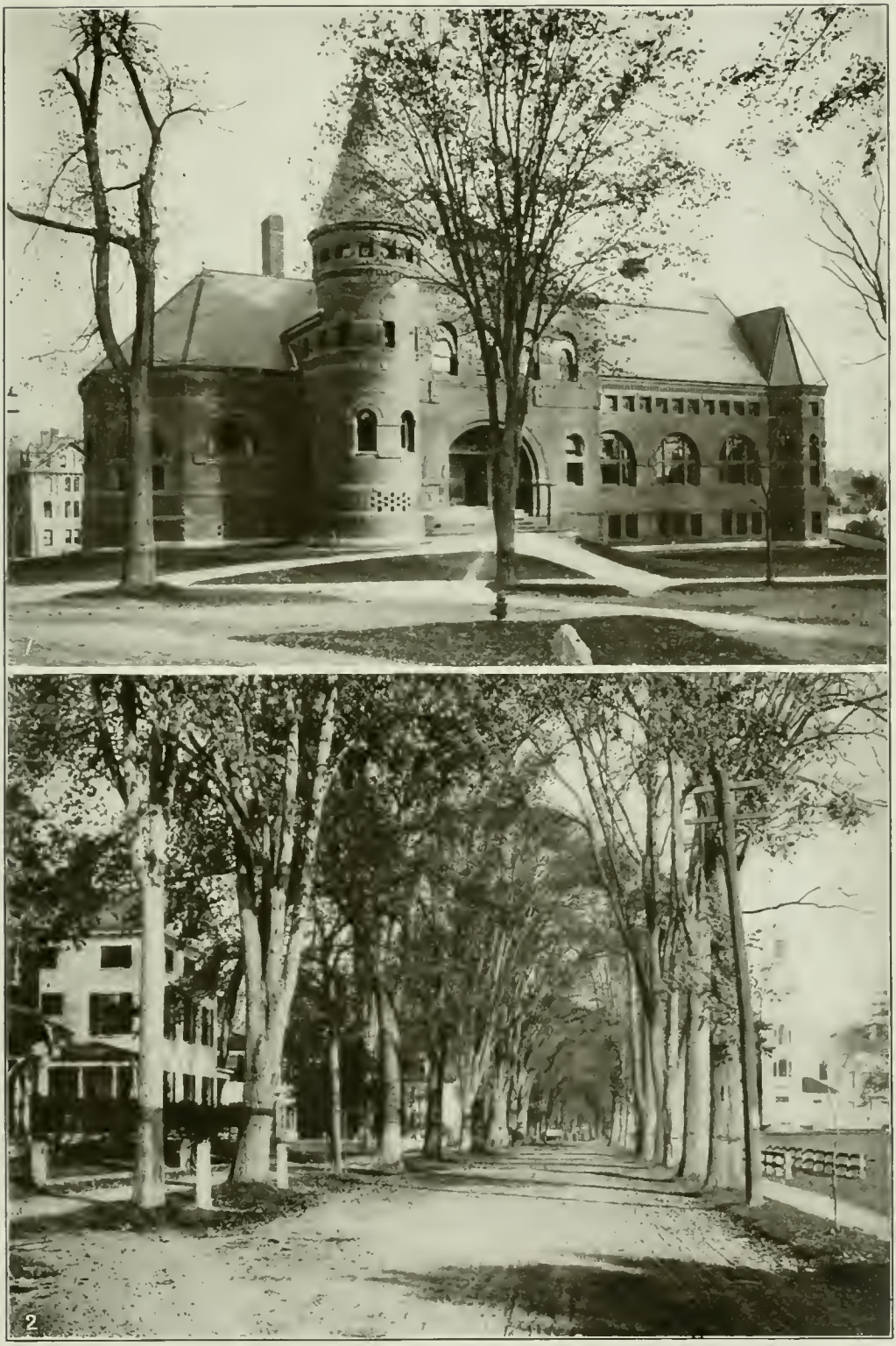
being the only prison built in 1809 for the custody of the French prisoners of war at a cost of $1,500,000. At one time it contained 10,000 inmates. It covers an area of 30 acres, and was built up for the reception of convicts. Considerable skill in cultivating the moor by convict labor have turned out successfully. The large powder works and a meteorological observatory are at Lee Moor. Dartmoor offers considerable attractions to the tourist and naturalist. Druidical and other aboriginal remains may be found, especially Grey Wethers, which is thought to have been a Druidical temple. The dolmens, cairns, and other indications of an ancient town, are found at Drewsteignton. Since 1337 Dartmoor has been annexed to the duchy of Cornwall.

Dartmoor Massacre, The, 6 April 1815. During the War of 1812 the American naval prisoners of the British, with impressed American seamen discharged from British vessels, were collected at Dartmoor military prison. On 31 March 1815 they numbered 5,693, including about 1,000 negroes. They had heard of the Peace of Ghent, 24 Dec. 1814, and expected immediate release; but the British government refused to let them go on parole, or take any steps till the treaty was ratified by the Senate, 17 Feb. 1815. It took several weeks for the American agent to secure ships for their transportation home, and the men grew very impatient. On 4 April the dishonest food contractor attempted to work off some damaged hardtack on them in place of soft bread, and was forced to yield by their insurrection, and the commandant, Capt. T. G. Shortland, suspected them of a design to break jail. This was the reverse of truth in general, as they would lose their chance of going on the cartels; but a few had made reckless threats of the sort, and the commandant was very uneasy. About 6 P.M. of the 6th he discovered a hole from one of the five prisons to the barrack yard near the gun-racks. Others had been begun, apparently for pastime. Some prisoners were outside the guard railing merrily pelting each other with turf, and many more near the breach (and the gambling tables), though the signal for return to prisons had sounded: altogether he was convinced of a plot, and rang the alarm bell to collect the officers and have the men ready. This luckless precaution brought back a crowd just going to quarters; just then a prisoner broke a gate-chain with an iron bar, and a number pressed through to the prison market square; and after attempts at persuasion, Shortland ordered a charge which drove part of the prisoners in. Those near the gate, however, hooted and taunted the soldiery, who fired a volley over their heads; the crowd yelled louder and threw stones, and the soldiers, probably without orders, fired a direct volley which killed and wounded a large number. Then, losing their heads, they followed the throng of prisoners struggling frantically to get within the prison doors, shooting them down as they went, some even going up to the doors and firing in; while others ran up to the walls and fired into the fleeing knots below. Finally the captain, a lieutenant, and the hospital surgeon (the other officers being at dinner) succeeded in stopping the murder and caring for the wounded — about 60, 30 seriously, besides 7 killed outright. The affair was examined by a joint commission, Charles King for the United States and F. S. Larpent for Great Britain, who agreed in exonerating Shortland, justifying the first firing, blaming the subsequent, and pronouncing the culprits undiscoverable. The British government provided for the families of the killed, pensioned the disabled, and promoted Shortland. Consult: Charles Andrews, 'The Prisoners' Memoirs; or Dartmoor Prison'; Cobb, 'A Green Hand's First Cruise, Together with Five Months in Dartmoor.'

Dart Moth, a name applied to the genus *Agrotis*, a night-flying moth of destructive habits, the caterpillar of which is widely known as the cut-worm (q.v.). A European species is the winter dart moth which destroys wheat. The American group includes several species, most of which appear about midsummer.

Dartmouth, dart'mŭth, Canada, town of Halifax County, Nova Scotia; at the mouth of a small river flowing into Halifax Harbor, opposite Halifax, of which it is practically a suburb. It has fine private residences, churches, and schools, and is the seat of the Provincial Asylum for the Insane. The chief manufactories are iron foundries, rolling mills, a sugar-refinery, tanneries, rope works, a brewery, soap and cocoa works, molasses blending works, boiler works, marine railway works, and flour mills. The municipality controls its steam ferry to Halifax and the water and sewerage works. Fort Clarence, below the town, defends the dangerous Eastern Passage into the harbor. Dartmouth was destroyed by the Indians two years after its founding in 1749, but afterward rebuilt. Pop. (1901) 4,806.

Dartmouth College, a seat of learning in Hanover, N. H., which received its charter in 1769, and opened its doors the following year under the presidency of Eleazer Wheelock, D.D. It grew out of an earlier school established by Eleazer Wheelock in Lebanon, Conn., and designed for the education of Indian children. The idea of this school had been suggested to him by his success in educating a young Mohegan Indian, Samson Occom, who became a remarkable preacher. Other pupils from several Indian tribes were afterward received and the school became an object of public attention and interest. In 1754, a farmer named Joshua Moor gave a house and two acres of land for the purposes of the institution, which was from this time known as Moor's Indian Charity School. Occom, accompanied by the Rev. Nathaniel Whitaker, visited England to collect funds; a sum of over $50,000 was subscribed, and a board of trustees was there organized, of which Lord Dartmouth, one of the subscribers, was made president. The school was so much resorted to by the native tribes that Dr. Wheelock determined to transfer to some place near to them. Many offers of situation were extended to him, but he selected the town of Hanover, on the Connecticut River, in the western part of the State of New Hampshire, and grants of about 44,000 acres of land were made to him. The institution was chartered by Gov. Wentworth under the name of a college, with all the privileges and immunities of any university within the British realm, and was called Dartmouth College in honor of the Earl of Dartmouth. Moor's school soon afterward obtained an in-



1. Wilson Library.

2. Faculty Avenue.

dependent charter, and still remains as an academical or preparatory department. In 1770 Dr. Wheelock removed his family and school, consisting of 18 whites and 6 Indians, from Lebanon to the wilderness of Hanover, where the whole colony lived in log huts. In 1771 the first class of four students was graduated. President Wheelock retained his office till his death in 1779, and was succeeded by his son, John Wheelock, who, in 1782, was sent by the trustees to Europe to promote the interests of the college; and through introductions by Gen. Washington, Dr. Franklin, and John Adams, he obtained considerable sums of money, philosophical instruments, and other valuable donations. William, Prince of Orange, was one of the donors. Wheelock returned in 1784, and after a presidency of 36 years was removed from the office by the trustees, in 1815. This act, which had its origin in a local religious controversy, led to a conflict with the legislature of the State; that body claimed the right to amend a charter of which it was the guardian, and in 1816 passed acts creating a new corporation, in which the property was vested, and changing the title of the college to Dartmouth University. The old trustees began a suit for the recovery of the college property. (See DARTMOUTH COLLEGE CASE.) Wheelock, who was succeeded as president of the college by Francis Brown, was raised to the presidency of the university, in February 1817, by the trustees of that institution, but died within two months. He was succeeded by William Allen, D.D., and in 1819 the "College Case" was decided in favor of the college, when the university disbanded.

Dartmouth College still remains an institution for men only. It comprises, besides the regular classical department: the medical school, founded in 1798; the "Chandler School of Science," established in 1851, by the trustees, on the receipt of a bequest of $50,000 from Abiel Chandler, who left it to them in trust "for the establishment and support of a permanent department or school of instruction in the college, in the practical and useful arts of life." The course in this school, leading to the degree of bachelor of science, covering four years, and including courses in general science, political science, modern languages, mathematics, and history, was brought into close relation with the academic course in 1893. Another department is "The Thayer School of Civil Engineering," founded in 1867 by Sylvanus Thayer, a graduate of Dartmouth. This is a graduate school, comprising a two years' course in civil engineering. The government of this school is vested in a board of five overseers, of whom one is the president of Dartmouth College. In 1900, the trustees created the "Amos Tuck School of Administration and Finance," according to the terms of the Amos Tuck Endowment Fund, the gift of $300,000 by Mr. Edward Tuck, of the class of 1862, as a memorial to his father, of the class of 1835. This school is post-graduate in nature and is established in the interest of college men who desire to engage in affairs rather than enter the professions. The report of the college for 1905 gives the following statistics: Professors, 87; number of students, 926; volumes in library, 100,000, and 20,000 pamphlets; and value of property including endowments, $3,500,000.

CHARLES F. EMERSON,
Dean of Faculty.

Dartmouth College Case, The. The Dartmouth College Case is the name by which is commonly known the action entitled Trustees of Dartmouth College *v.* Woodward, which is reported in volume four of Wheaton's United States Supreme Court reports. Perhaps no decision ever rendered in any tribunal has attracted more attention or exerted a greater influence over the legislative and judicial history of our land than has the decision in this case, which arose as follows:

In the year 1769 the Reverend Eleazar Wheelock, aided financially and politically by friends in England and America, conspicuous among whom was the Earl of Dartmouth, and with the assistance of the Province of New Hampshire, given in the form of extensive land grants, founded Dartmouth College under a charter from King George III. of England. This charter vested the control of the institution in a board of trustees, who were designated by Mr. Wheelock to manage the same, and under the management of those trustees so incorporated and their successors the college grew and prospered until the year 1815, when the State legislature passed an act amending its charter by which they curtailed the power of its trustees, changed its name to Dartmouth University and made it a State institution subject to State control. For protection against this infringement of their powers, the trustees had recourse to the courts in the now famous case above named.

In the State tribunals the decision went against the college trustees and an appeal was taken to the Supreme Court of the United States, the appeal being based upon the theory that the charter granting the control of the college to the trustees was a contract, that under Section X. of Article 1 of the Federal Constitution no State can pass an act impairing the obligation of any contract, and that the said act of the New Hampshire Legislature violated the contract of the charter of Dartmouth College.

It should be remembered that in 1819 when the case came up for final hearing, the popular views of the scope and effect of the National Constitution were far from harmonious. All then regarded that instrument as the greatest existing governmental compact, but the Republican party then in power demanded that it be so strictly construed as to preserve unimpaired the rights and powers of the individual States. On the other hand, there then presided over the Federal Supreme Bench, in the person of John Marshall, one of the "midnight appointees" of John Adams, the last President of that Federalist party which demanded so liberal a construction of the instrument as to give the country a strong national government. Of the section of the Constitution invoked, we may safely say with Ordronaux that "Drafted at a time when commerce was in its infancy; when public credit was depreciated to the lowest ebb; and confidence in monetary transactions almost destroyed, it was manifestly introduced as a barrier against the tide of repudiation which threatened to overwhelm both public and private credit." The framers of the Constitution never intended that clause to be given the interpretation urged in this case. But the case was up before a court

presided over by the jurist who has been truthfully said to have "clothed the Constitution a skeleton and clothed it with flesh and blood." Eventually, when it was clearly shown, as it was in the celebrated argument of Daniel Webster for the college trustees, that this case came truly within the provisions of that section, in principle, the court, guided by John Marshall, held that the act of the New Hampshire Legislature was void because it impaired the obligation of a contract. Justice Duvall alone dissented.

This decision has perhaps been more severely criticised and has perhaps given rise to more strenuous efforts to escape its consequences than has any other decision of the tribunal which rendered it, and the reasons are obvious. While it gave assurance that capital invested in chartered business and charitable ventures would be forever protected from legislative interference, it also invited political corruption by saying in effect to promoters of corporations that the courts would protect them in the possession of every concession or right which they beguiled from pliant legislative bodies. It made possible the mechanical and industrial achievements of the 19th century in this country, but it also made profitable the limitless corruption which has attended those achievements and which has frequently, by virtue of this decision, stripped the government of very important powers.

But the correctness of a judicial decision is not to be gauged by its influence for weal or woe. Rather should that be determined by its conformity to the Constitution, the statutes and the judicial precedents upon which it rests and the approval given it by later decisions. Judged by this test we must hold that Marshall and his colleagues decided well in the Dartmouth College Case. The Supreme Court of the United States had early laid down the rule that there are certain vital principles of republican government which will overrule a flagrant and apparent abuse of legislative power. It had in the year 1810 declared a law granting land to private companies to be in effect a contract which could not be so repealed as to impair the obligation of that contract. If the passage of the law were procured by fraud the court there doubted its power to declare it void for those reasons, but if that power existed it could be exercised only under those rules of law and equity which govern private transactions. Two years later there came before the same court a case involving a somewhat similar question. The State of New Jersey had traded land with an Indian tribe and had, by legislative enactment, provided that the Indians should forever hold the lands received by them free from taxation. With the consent of the State they sold their lands and, the question being properly presented, the court held that the law granting the exemption was a contract, that the exemption ran with the land and that the purchasers from the Indians enjoyed the same exemption.

By the decision in the Dartmouth College Case the rules laid down in the foregoing cases were followed and their application extended to contracts in charters of incorporation, but their force when so applied had already been limited by another line of decisions. In 1804 Chief Justice Marshall, speaking for the court, had said that the charter gives to a corporation all of the powers it possesses and no powers not granted can be exercised. A little later he had decided that there is a difference between a grant of corporate existence and a grant of peculiar remedies. The first is general. The second can only be exercised in those courts which the power bestowing the privilege can regulate. Moreover, as the bank charter involved in that case contained a clause making it a felony to counterfeit its notes, the court believed it to be a public act and subject to repeal by succeeding legislatures. And in the year 1810 the same court had decided that the right to use a peculiar form of attachment granted in its charter to a bank could be taken away at any time because "The forms of administering justice and the duties and powers of the courts as incident to the exercise of a branch of the sovereign power must ever be subject to the legislative will and the power over them is inalienable so as to bind subsequent legislatures."

It is thus made fully apparent that the Dartmouth College Case decided only that if a legislative grant, whether made in the form of a charter of incorporation or in any other form, conveyed to private citizens that which the legislature had power to contract away, the grant so made was a contract and no succeeding legislature could rescind the same without following the same rules which govern the rescission of private contracts. But if there is any doubt that such was the understanding of the chief justice who wrote the opinion of the court in that case, the same will be removed by a consideration of certain later decisions in which he participated. In the year 1821 the court over which he presided decided that Congress had power to incorporate a lottery to do business beyond the limits of the District of Columbia, yet, where no mention was made thereof in the charter, it would not be presumed that Congress had done so and had thereby deprived the States of their power to regulate lotteries by preventing the sale of tickets within their boundaries. In the same year the same court decided that a town government cannot contract away its legislative power. And in the case of Providence Bank *v.* Billings, the court presided over by Marshall decided that while a State might, through its legislature, grant immunity from taxation, it could not be presumed to have done so, and that, in the absence of any agreement to the contrary, it might tax to death a franchise which it had itself granted.

But the effect of the Dartmouth College decision was not fully understood at the time of its rendition and the States eagerly availed themselves of a suggestion found in the decision itself to the effect that if they wished the right to amend, alter or repeal charters granted by them they must expressly reserve that power. Such a reservation, whether expressed in the charter itself, the constitution or the general laws of the State, has been held to have the effect of "placing the State legislature back on the same platform of power and control over the charter containing it, as it would have occupied had the constitutional restriction never existed." Yet the later decisions hold that this reserve power must be reasonably exercised. The alterations must be made in good faith and consistent with the objects and scope of the act of incorporation. Sheer oppression and fraud cannot be inflicted under the guise of amendment or alteration. This power cannot be so

employed as to defeat or substantially impair the object of the grant or any right which has become vested under it. Where this power has been reserved, a State may tax property which it has forever exempted from taxation, but the taxes must not be greater than those imposed upon other property. It can regulate the charges of common carriers, but no such legislation must amount to the taking of private property for public purposes without due process of law. We thus see that not only was the Dartmouth College decision as moderate as any of the later cases which have been said to have practically overruled it, but that even where reservations in charters have obviated the effect of that decision the later courts have reached a similar conclusion by a different chain of logic.

Bibliography.—Cook, 'The Corporation Problem'; Cooley, 'Constitutional Limitations'; Curtis, 'Life of Daniel Webster'; Hitchcock, 'Constitutional Development of the United States as Influenced by Chief Justice Marshall'; Morawetz, 'Private Corporations'; Shirley, 'The Dartmouth College Causes and the Supreme Court'; Story, 'On the Constitution'; Tiedeman, 'The Unwritten Constitution of the United States'; Von Holst, 'Constitutional Law of the United States.'

S. V. Wright,
Attorney, San Luis Obispo, Cal.

Darton, Nelson Horatio, American geologist: b. Brooklyn, N. Y., 17 Dec. 1865. He received a common school education and became a chemist and later a geologist. He has made many geological surveys for the United States Government. His chief work is 'Catalogue of North American Geology, 1732–1891.' Since 1890 he has been connected with the United States Geological Survey.

D'Arusmont, dä-rüs-môn, **Madame Frances** (maiden name Fanny Wright), American philanthropist and author: b. Dundee, Scotland, 6 Sept. 1795; d. Cincinnati, Ohio. She married M. d'Arusmont in 1838, but the marriage was not a congenial one and her later years were spent in the United States. She lectured extensively on social, religious, and political questions. Among her works are: 'Views on Society and Manners in America'; 'Altorf,' a tragedy (1819); 'Lectures on Free Inquiry' (1836).

Darwar, där'wär, or **Dharwar,** India, a town and fortress in the district of Bombay, 285 miles southeast of Bombay city, capital of a district of the same name. The town exports cotton and rice. It is connected by railroad with Goa, the Portuguese colony, and with other places. Pop. (1901) 31,279. The district of Darwar has an area of 4,603 square miles. The soil and climate are well adapted to the cultivation of cotton. Pop. 1,051,314.

Dar'wen (till 1889 Over Darwen), England, a municipal borough in the county of Lancaster. It has among its public buildings numerous churches and chapels, a market-house, public baths, free library, theatre, technical-school, hospitals, etc. The staple manufacture is cotton. The other manufactures are paper, iron castings, machinery, earthenware, etc. The water, electric, and gas plants are owned by the city. Pop. (1901) 38,211.

Darwin, Charles Robert, English naturalist: b. Shrewsbury, 12 Feb. 1809; d. Down, Kent, 19 April 1882. His father, Robert Waring Darwin, was a distinguished physician of that town, the son of a still more distinguished father, Erasmus Darwin (q.v.) He was educated at Shrewsbury school, and at the universities of Edinburgh and Cambridge. He early devoted himself to the study of natural history, and in 1831 was appointed naturalist to the surveying voyage of H.M.S. Beagle, comanded by Captain (afterwards Admiral) Fitzroy. He served without salary, and paid a portion of his expenses on condition of having at his own disposal such collections of specimens as he might make during the voyage. The vessel sailed in December 1831, and did not return till October 1836, after having circumnavigated the globe. Darwin came home with rich stores of knowledge, part of which he soon gave to the public in such works as his 'Journal of Researches into the Natural History,' etc. (1839), of the countries visited, the 'Zoology of the Voyage of the Beagle' (1840–42); 'Structure and Distribution of Coral Reefs' (1842); 'Volcanic Islands' (1844); 'Geological Observations' (1846). Though known among naturalists as a man of distinguished ability, to the general public his name was not familiar, when all at once it attained a celebrity second to none by the publication in 1859 of 'The Origin of Species by Means of Natural Selection.' This work, scouted and derided though it was at first in certain quarters, may be said to have worked nothing less than a revolution in biological science. In it for the first time was given a full exposition of the theory of evolution as applied to plants and animals, the origin of species being explained on the hypothesis of natural selection. The central idea of the work is that all forms of organic life are derived from a small number of primitive types, and that all the vast variety of vegetable and animal organisms now existing, or having formerly existed, have owed their origin to the slow and gradual operation of the modifying influence of local or special causes transmitted hereditarily; such forms as best suit any particular time and locality being selected and adapted by the action of natural laws for that time and locality. The theory of evolution was warmly taken up by some of the ablest men of science, and now there are few who have not in whole or in part given in their adherence to the principle. The rest of his works are largely based on the material he had accumulated for the elaboration of the great theory. See Darwinian Theory. The principal are a treatise on the 'Fertilization of Orchids' (1862); 'Domesticated Animals and Cultivated Plants'; or 'The Principle of Variation, etc., under Domestication' (1867); 'Descent of Man and Variation in Relation to Sex' (1871); 'The Expression of the Emotions in Man and Animals' (1872); 'Movements and Habits of Climbing Plants' (2d ed., 1875); 'Insectivorous Plants' (1875); 'Cross and Self-Fertilization' (1876); 'Different Forms of Flowers' (1877); 'The Power of Movement in Plants' (1880); 'The Formation of Vegetable Mould' (1881); the latter dealing exhaustively with the common earthworm. Darwin was buried in Westminster Abbey. See 'Life and Letters of Charles Darwin' (1887).

Darwin, Erasmus, English physician and poet, b. near Newark, Nottinghamshire, 12 Dec. 1731; d. near Derby, 18 April 1802. Settling at Lichfield he acquired a great reputation and an extensive practice. His son, Robert, was father of the famous Charles Darwin. Erasmus Darwin's name is chiefly remembered for his poem of 'The Botanic Garden,' which is composed in two parts, the first treats of the 'Economy of Vegetation' (1792), the second of the 'Loves of the Plants' (first published in 1789). It was received with much favor; but a very successful parody, entitled: 'The Loves of the Triangles,' published in the 'Anti-Jacobin' (and written either by Canning or Frere), greatly damaged its popularity. In 1794 Dr. Darwin published the first volume of 'Zoonomia, or the Laws of Organic Life'; the second volume, completing the work, appeared two years afterward. In 1800 he published 'Phytologia, or the Philosophy of Agriculture and Gardening.'

Darwin, Francis, English botanist: b. Down, Kent, 16 Aug. 1848. He is the son of Charles Robert Darwin (q.v.); was educated at Trinity College, Cambridge, and studied medicine at St. George's Hospital in London. He did not practise medicine, but assisted his father in his work at Down, and was later made reader in botany at Trinity College. His works include: 'Life and Letters of Charles Darwin' (1887); 'Charles Darwin' (1892); 'Practical Physiology of Plants' (with E. H. Acton 1894); 'Elements of Botany' (1895); and a number of papers on botanical subjects.

Darwin, George Howard, English scientist, b. Down, Kent, 9 July 1845. He is the eldest son of Charles Robert Darwin (q.v.); was educated at Cambridge, studied law and was admitted to the bar, but did not practise. He was a fellow of Trinity College, Cambridge, 1868–78; was a member of the expedition to Sicily to observe the eclipse in 1870–71; and was appointed Plumian professor of astronomy and experimental philosophy at Cambridge in 1883. Among his writings are: 'Small Deflections of the Plumb Line due to the Movement of the Earth'; 'Periodic Orbits' (1896); 'Tides and Kindred Phenomena in the Solar System' (1898), etc. He was knighted by King Edward in 1905.

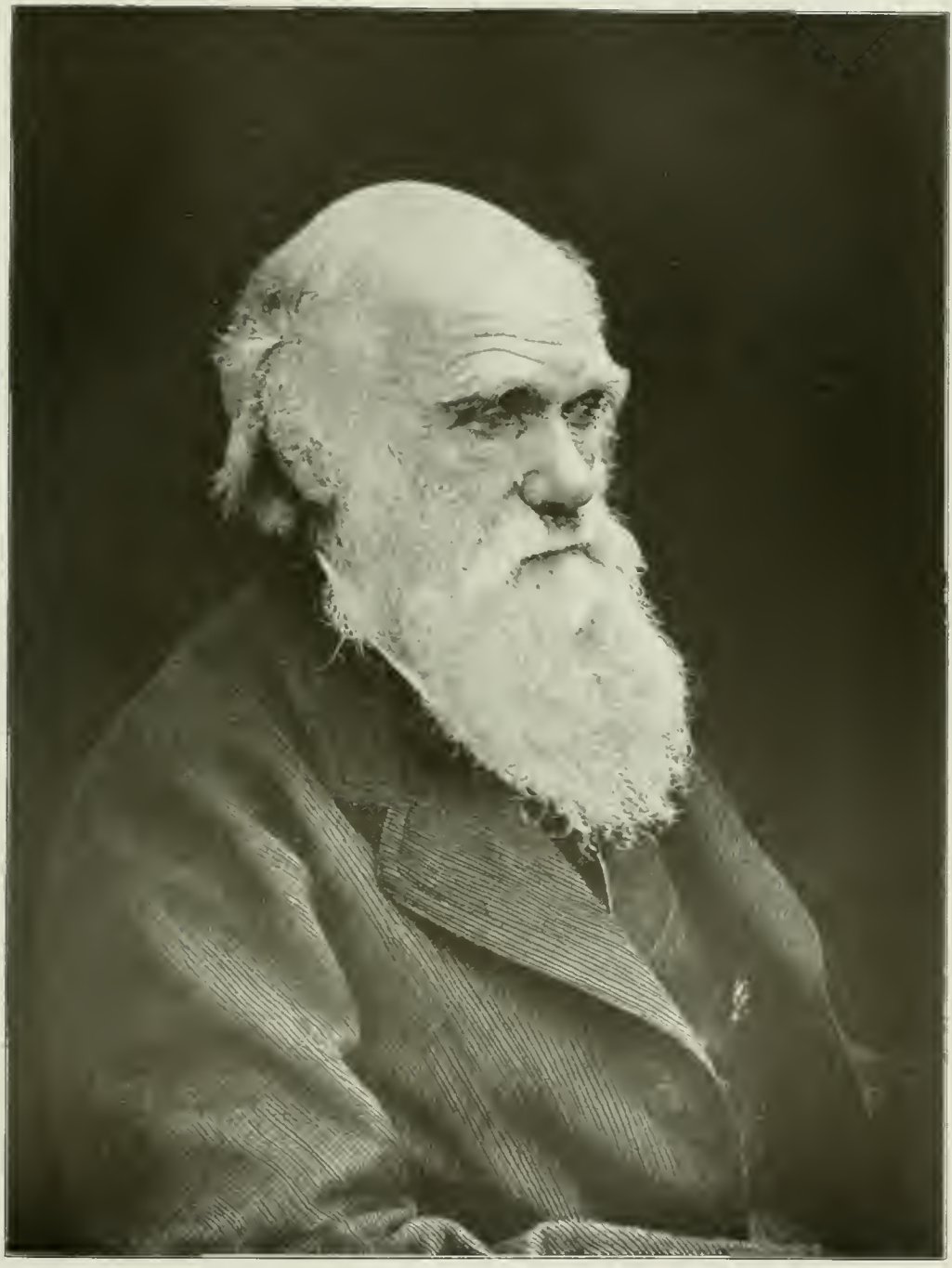
Darwinian Theory, the explanation of the working of natural selection in effecting specific changes in plants and animals. "Darwinism" must not be confused with "Evolution." The term Darwinism is applied to one particular interpretation of the mechanism of the universe, and is summarized in Darwin's great work: 'The Origin of Species by Means of Natural Selection.' Whatever may be the future development of our evolutionary ideas, the epoch-making importance of the Darwinian theory will be unaltered.

Outline of Origin of Species.—To gain an insight into the means of modification, Darwin begins with a study of the variation of plants and animals under domestication. Those who admit the unity of domestic races should be cautious in denying the unity of the wild ones. Domestic races all exhibit adaptations to man's use or fancy, rather than to their own good. The key to this is man's power of selection. Nature gives successive variations, man accumulates these, so making for himself useful breeds, and often (for example, in sheep, cattle, roses, dahlias) profoundly modifies their character even in a single human lifetime; so that in all the characteristics to which he pays attention they may differ more than the distinct species of the same genera. Unconscious selection, which results from everyone trying to possess and breed the best animals, is even more important than conscious selection. Two flocks of Leicester sheep kept equally pure appear quite different varieties after 50 years. Such slowly accumulated change explains why we know so little of the origin of domestic races: and its absence in regions inhabited by uncivilized man explains why these yield no plants worth immediate culture. Human selection is facilitated (1) by the keeping of large numbers, since variations will be more frequent; and (2) by preventing free intercrossing. Some species vary more than others.

Variation Under Nature.—No two blades of grass are alike, and far more marked differences often occur, several strains or varieties sometimes existing in the same species. Between these strains, and much more frequently between forms which systematic botanists and zoologists rank as true species, perfectly intermediate forms may occur. No agreement about the definition of species (the amount of difference necessary to give any two forms specific rank) has ever been reached. Individual differences are of the highest importance, as the first steps toward the slightest varieties worth recording: these in turn toward more distinct and permanent varieties; these varieties again toward sub-species, and in the next stage to species, though extinction may often arrest the process. The species which present most varieties are those which have the greatest geographical range, or the widest diffusion in their own territory, or which possess the greatest number of individuals.

Struggle for Existence.—All organic beings tend to increase with extreme rapidity, so that if they were not kept down, the earth would soon be covered by the progeny of a single pair. Since organisms are reproducing themselves so rapidly, and not all their offspring can escape their enemies, get food and live, much less leave progeny in turn, there must in every case be a struggle for existence, either of one individual with another of the same species, with the individuals of distinct species, or with the physical conditions of life; often with all these at once, and that more or less intensely throughout the whole duration of life. The checks which prevent increase are more obscure, and vary in each case. In all cases the amount of food gives the limit. The youngest organisms generally suffer most. The stock of game on an estate depends chiefly on the destruction of vermin. Climate is important, and periodic seasons of extreme cold and drought seem the most effective of all checks. Epidemics too may occur, especially where numbers have inordinately increased. The struggle for life is most severe among individuals and varieties of the same species, and among the species of the same genus, since these tend to fill the same place in the economy of nature. The structure of every being is related to that of the others with which it competes, or from which it seeks to escape, or on which it preys.

Natural Selection.—The natural process which results in the preservation of favorable variations, and the elimination of injurious ones, is termed by Darwin "Natural Selection," or less



CHARLES DARWIN.

figuratively by Spencer, the "Survival of the Fittest." No country can be named where the native inhabitants are perfectly adapted to their conditions and competitors, for as some foreigners have taken firm possession in every country, we may safely conclude that the natives might have been modified with advantage to resist them. Human selection acts only for man's own good, on mere external and visible characters, and irregularly throughout a short period; natural selection acts for the good of the being itself, on the whole machinery of its whole life, and incessantly on the species, throughout almost infinite time. It leads to the improvement of each creature in relation to its organic and inorganic conditions of life, and consequently in most cases to what must be regarded as an advance in organization. The circumstances favorable to the production of new forms are great variability; large numbers of individuals; the complex effects of intercrossing; isolation in small areas; also extension over continental ones, especially if these vary in altitude; and considerable lapse of time. Rare species are shown to be in process of extinction. The divergence of character in domestic breeds, largely due to the fact that "fanciers do not, and will not, admire a medium standard, but like extremes," applies throughout nature from the circumstance that the more diversified the descendants from any one species become in structure, constitution and habits, by so much will they be better enabled to seize on many and widely diversified places in nature, and so to increase in numbers. A carnivorous animal which has reached the maximum numbers its territory can support, cannot succeed in increasing unless its varying descendants seize places hitherto occupied by other animals. This must hold equally true of all species, and is separately demonstrated for plants. The greatest amount of life can be supported by help of proportionally great diversification of structure; hence, in small areas where competition is severe, the inhabitants are extremely varied.

Sexual Selection.—Not merely do individuals struggle for existence, but the males struggle for the females, and the most vigorous tend to leave most progeny. Several weapons, offensive and defensive, like the cock's spurs, the stag's horns, or the lion's mane, are used in this struggle, and the most useful variations are those which are transmitted. Just as man can in a short time give beauty to his domestic birds, so there is no reason to doubt that female birds, in thousands of generations by selecting, as they are observed to do, the most melodious or beautiful males, might produce a marked result, and many sexual differences are thus explained.

Laws of Variation.—The same laws appear to have acted in producing the lesser differences between varieties of the same species, and the greater differences between species of the same genus. Specific characters are more variable than generic, and varietal than either. Rudimentary organs and secondary sexual characters are variable. Zebra-like stripes on horses, or wood-pigeon's markings on fantails, tumblers, etc., may be explained as reversions toward their ancient progenitors.

Geological Succession of Organic Beings.—The most ancient forms differ widely from those now living, yet frequently present characters intermediate between groups now widely divergent, and resemble the embryos of the more recent and more highly specialized animals belonging to the same classes. These, and the important law of the succession of the same types within the same areas during the later geological periods, and most notably between the Tertiary Period and the present time, cease to be mysterious, and become at once thoroughly intelligible on the principle of inheritance, and on that alone. Darwin's belief that the distinctness of birds from all other vertebrates was to be accounted for by the extinction of a long line of progenitors connecting them with reptiles, was in 1859 a mere assumption; but in 1862 the long-tailed and palpably reptilian bird Archæopteryx was discovered, while in 1875 the researches of Marsh brought to light certain cretaceous birds, one with teeth set in a groove, the other with teeth in sockets, and with bi-concave vertebræ. Besides these reptilian birds, bird-like reptiles have similarly been forthcoming, and the hypothesis of Darwin is thus admirably verified.

Geographical Distribution.—Neither the similarity nor the dissimilarity of the inhabitants of various regions, whether of land or of sea, can be accounted for by identity or differences of climate, or other physical conditions; but both are related in the most striking degree to the absence or presence of barriers to migration between those regions.

Morphological Arguments.—The physiological and distributional lines of argument furnished by morphology are mainly four, and are derived from (a) Classification, (b) Homologies, (c) Embryology, (d) Rudimentary Organs. The great fact of classification is that organic beings, throughout all time, are arranged in groups subordinated under other groups, individuals under varieties, and these again under species; species under genera; genera under sub-families, families, and orders; and all under a few grand classes. The nature of all these relationships established by naturalists receives a simple and natural explanation on the view of the common descent of allied forms with modification through variation and natural selection, no other explanation ever having been attempted. The element of descent is already used in linking all the sexes, ages, forms, and varieties of the same species, widely though these may differ from each other in structure.

The members of the same class, independently of their habits of life, resemble one another in their general plan of organization. Thus the hand of man, the digging-paw of the mole, the leg of the horse, the paddle of the porpoise, and the wing of the bat, are all constructed on the same pattern, bone corresponding to bone. This conformity to type is "powerfully suggestive of true relationship, of inheritance from a common ancestor"; and admits of a simple explanation in terms of the evolutionary theory, thus strengthening that theory.

Serial Homology is that unity of type which is found on comparing the different parts and organs in the same individual. The complex and varied jaws and legs of a lobster, or the different leaves, sepals, petals, stamens, and pistils of a flower, are all found to be modifications of a simple limb and a simple leaf-organ respectively. Not only are such metamorphoses apparent on comparison, but they can be actually observed during the development of each individual. So closely do the embryos of the most distinct species belonging to the same class resemble each

[illegible] was unable to decide whether [illegible] specimens were lizards [illegible] or mammals. The process of development goes from the general to the special, thus there is [illegible] variance in organization. In peculiar conditions degeneration may occur. All [illegible] are explained on the principle of successive slight variations not necessarily or generally appearing very early in life, and inheritance at a corresponding period; hence it is in the highest degree probable that most embryonic stages show more or less completely the progenitor of the group in its adult state; and embryology thus rises greatly in interest. Darwin points out that the theory of evolution by natural selection is no more inimical to religion than is that of gravitation, to which the same objection was raised.

JOHN FISKE.

Darwinian Tubercle, a small raised portion, or tubercle, that may be found on the pinna of the ear. It is said to be present in a number of the primates and by many scientists has been regarded as an evidence of degeneracy in mankind. Different forms of Darwinian tubercles are described by anthropologists, but they have no real special significance.

Dasent, dā'sĕnt, Sir George Webbe, English philologist and novelist: b. St. Vincent, West Indies, 1820; d. near Ascot, Berkshire, 11 June 1896. He was for a while one of the editors of the London *Times*, and was one of the civil service commissioners. He was eminent as a scholar in the Norse languages, particularly Icelandic, and translated the 'Younger Edda,' besides many other ancient stories and legends of Iceland, and wrote 'The Norseman in Iceland' (1858); 'The Story of Burnt Njal' (1861). Among his original stories are: 'Annals of an Eventful Life'; 'Three to One'; 'Half a Life.'

Dash, Countess, pseudonym of **Gabrielle Anne Cisterne de Courtiras,** VICOMTESSE DE SAINT-MARS. French novelist: b. Poitiers, 2 Aug. 1804; d. 11 Sept. 1872. She was a very prolific writer, producing often five or six stories in the course of a year. Life in high society is her theme, and especially wayward love in high society, as the titles of most of her novels indicate: 'Bussy-Rabutin's Amours'; 'Gallantries of the Court of Louis XV.'; 'Last Amours of Mme du Barry'; 'Adventures of a Young Married Woman.'

Dashkoff, dash'kŏf, Princess Ekat'erina Romanov'na, Russian scholar: b. St. Petersburg 22 March 1743; d. 16 Jan. 1810. She married Prince Dashkoff when only 15 years old, but was left a widow three years after. She was an intimate friend of the Empress Catharine II., and one of the heads of the conspiracy formed against Peter III., the success of which secured the throne to Catharine. Soon afterward quarreling with Catharine, she obtained permission to travel, and visited Germany, England, France, and Italy, making the acquaintance of many eminent men. On her return the princess was appointed director of the Academy of Arts and Sciences; and in 1783, president of the Russian Academy, established at her own suggestion in imitation of the French Academie. Besides writing several comedies and occasional papers, the Princess Dashkoff was mainly instrumental in inducing the Russian Academy to draw up a dictionary of the Russian language, and herself executed part of the work. See her very interesting autobiography (trans. 1840).

Daskam, Josephine Dodge, American writer: b. Stamford, Conn., 17 Feb. 1870. She was educated at Smith College and in addition to frequent contributions to magazines has published in book form 'Smith College Stories' (1900); 'A Sister's Vocation and Other Girls' Stories' (1900); 'The Imp and the Angel' (1901); 'The Madness of Philip' (1900); 'The Best Nonsense Verses' (edited; 1902).

Dass, dass, Peder, pā'der, or **Petter,** Norwegian poet: b. Nord-Hero, parish of Alstahoog, Nordland, 1647; d. Aug. 1708. He studied at the University of Copenhagen, became pastor of the parish of Alstahoog in 1689 and grew rich from commerce and fisheries, buying for himself the royal domain of Veisen. He became the most popular poet in Norway, leaving 127 poems of which only 24 are now extant, his masterpiece being a descriptive poem: 'The Trumpet of the Nordland,' written in the Dano-Norwegian dialect.

Dassy, or **Dassie,** the name given in South Africa to the rock-rabbit (*Procavia capensis*), the Dutch name for which is klip-das. The name dassy is merely a diminutive in local use, especially in Cape Colony. See HYRAX.

Dasyproc'ta, a genus of agoutis (*Dasyproctidæ*), a familiar group of rodent mammals inhabiting Central and South America, and some of the West India Islands. The agoutis are a little larger than the common rabbit, have a rabbit-like head, but with short ears, hooped, pig-like claws, and are swift-footed. They live in the woodland, and search for food by night in the open country.

Dasyure, dăs'ī-ūr, a marsupial native to Australasia; and belonging to the family *Dasyuridæ*. It is the survivor of the fossil forms found in Tertiary strata in South America, and elsewhere; and is allied to the opossum. The hind and fore legs are about equal in length, and the toes are furnished with claws; the long hairy tails are not prehensile. The dasyures are chiefly strong, fierce creatures of cat-like propensities, whose depredations have caused heavy losses in farming and ranching districts, so that the colonists of Australasia, more especially those of Tasmania, have nearly exterminated them, by persistent effort. Among them we find the Tasmanian zebra-wolf (*Thylacinus cynocephalus*), a wolf-like creature, rather smaller than the common wolf, with short fur, a long smooth tail, and rounded ears. Its color is brownish, and it is barred at the hinder portion of the back and the roots of the tail with dark stripes. It prowls about by night, making raids upon unguarded sheep-folds. By day, it skulks in caverns among the rocks. Another foe to the flocks is the Tasmanian Devil (*Sarcophilus ursinus*). This creature, in size like a badger, in appearance like a bear, is ponderous, powerful, dark-colored, and covered with a coat of long fur. It sleeps by day; and, like the zebra-wolf, seeks its prey by night. It is very strong and ferocious; but despite this, has been successfully put down by the colonists; in fact, it has been nearly exterminated. Another species is the Australian "native cat," a spotted creature, almost as large as a house-cat. It belongs to the genus *Dasyurus*,

in which are also several other and smaller species. Perhaps the most interesting of the small Dasyures, is the banded ant-eater (*Myrmecobius fasciatus*) found in western and southern Australia. It is a reddish brown in color, banded posteriorly with white; is about the size of a squirrel, and has a long protrusile tongue for gathering its insect food. It is considered as a practically unmodified representative of certain extinct marsupials found in the Secondary rocks of Europe. It lives in sandy plains, where it finds food in plenty. Other species, small as rats and mice, and living chiefly on insects, birds, eggs, etc., are found in the genus *Phascogale*, and allied genera; and the jerboa-like creature (*Antechinomys laniger*) constitutes another genus, of a single species. It is native to Queensland and New South Wales, but is very rare. See MARSUPIALS.

Data'ria, an office of the Curia Romana (q.v.) from which are sent forth certain classes of papal documents, as dispensations and appointments to Church benefices. The word had its origin in the formula of subscription of letters, for example, *Datæ Kalendis Martiis,* given (or sent) 1 March; that is the date of the document; and it is the duty of the Dataria to guard against possible errors of either dating or addressing documents, or in the tenor of the documents themselves.

Date, any given, fixed, or settled time; the time when any event happened; period; era; age; epoch; as, the date of the Christian era, the date of a historical occurrence, etc. Also, that addition to a writing which specifies the year, month, and day when it was given or executed; the number which marks the time when any writing, instrument, coin, picture, etc., was executed. Under the Romans the word *datum* was used to signify the day on which the bearers of imperial despatches received them at Rome, or delivered them in the provinces. It was also employed in documents in the time of the French Merovingian kings. See EPOCH; CHRONOLOGY.

Date Line. See INTERNATIONAL DATE LINE.

Date, or **Date Palm** (*Phœnix dactylifera*) a tall tree of the natural order *Palmaceæ.* It is most notable for its fruit, which is an important part of the daily food of the natives of western Asia and northern Africa, where the tree is indigenous and from whence large quantities of dried dates (the fruits), are exported to other countries. The tree is also cultivated in some other warm countries, including China, Italy, France, Spain and parts of the United States, — Florida, New Mexico, Arizona and California, in the last three of which a promising industry seems to be becoming started. The tree, which attains a height of 100 feet, and bears fruit for one or two centuries, is, like other palms, useful in many ways; nearly all its parts are used for something. Date seeds are roasted and used as a substitute for coffee, or ground and pressed for oil and the pomace used for stock food. The leaves are used for matting, baskets, thatch, etc.; the terminal bud as a vegetable: the wood for fence making and other purposes where great strain is not expected; the fibre of the bark for making rope; but the fruit, which contains proteids, gum, and pectin, and is particularly rich in sugar, is the most important part. It is one of the principal sources of wealth in the countries where the date is indigenous. It is believed that the leaves of this palm are the ones referred to in biblical writings, and at the present time the leaves of this palm are largely used upon Palm Sunday among Christians living where the trees abound. The leaves were also symbolical of victory, beauty, etc., among the ancient Greeks and Jews.

Since the male and female flowers are borne on separate trees, enough specimens of staminate flowering trees must be planted to fertilize the blossoms on the others which alone produce fruit. Since the plants obtained from seeds are of unknown sex until they flower, and since the proportion of inferior seedlings to seedlings which bear superior fruit is very large, the date is propagated by means of suckers, since these retain the characteristics of the parent. The young plants are set in sunny situations, in almost any kind of soil where water is within reach of the roots or can be supplied by irrigation. The sandy, alkaline soils of deserts seem more satisfactory than the richer soils necessary for the growth of general crops. The trees are very difficult to make grow after transplanting, because they demand special attention especially as to watering. A loss of 50 per cent is not uncommon even with the best of attention. The surviving trees should commence to bear when about eight years old. The fruit is borne in clusters which hang from the thick crown of large pinnate leaves. Individual trees produce from 300 to 500 pounds or more of fruit in a season. Consult: Bulletin No. 29, Arizona Experiment Station, Phœnix, Arizona.

Date-plum, a common name for plants of the genus *Diospyros,* of the ebony family (*Ebenaceæ*). The genus has about 160 species and is most abundantly represented in Asia. In America two species are known, the most common being the persimmon (q.v.), *D. virginiana.* The common date-plum or pishamin, also called the European lotus and the date of Trebizond (*D. lotus*), is a tree 18 to 30 feet high, with oblong shining leaves and small reddish-white flowers, a native of the coasts of the Caspian Sea, northern Africa, etc., but cultivated and naturalized in the south of England. Its fruit is of the size of a cherry, and in favorable climates larger, yellow, sweet, and astringent. It is eaten when overripe, like the medlar, or is used for preserves. This fruit has been supposed by some to be the *lotus* (q.v.) of the Lotophagi. *D. mabola* is cultivated as a fruit-tree in Mauritius. *D. kaki,* sometimes called the keg-fig, is a native of Japan, and occasionally is kept in greenhouses in France and England. The sweetmeat called *figues-caques* is made from this fruit in France. The fruit of some other species is also edible, as, for example, that of *D. decandra* of Cochin-China. See EBONY; PERSIMMON.

Date-shell, or **Date Fish,** a bivalve shell or its inhabitant of the genus *Pholas,* a kind of mollusk. They bore holes in clay, peat, and soft rocks, and in some instances in hard stone, as in columns from the Temple of Serapis, which were brought from Africa to Italy. Species of the date-shell are found in the Mediterranean and its arms, on the coast of California and in a few places on the west shore of the Pacific. Some are edible.

Datha, American cacique. He governed the province of Cheora, on the east coast of Florida, visited by Lucas Vasquez de Ayallon, auditor of San Domingo, in 1520. He was a giant, and Helps, in the 'Spanish Conquests in America,' says: 'His gigantic stature had been artificially produced, for it is said that the Indians of these parts had a method of elongating the bones of children when very young, a practice which they applied to those of royal race.'

Datholite. See DATOLITE.

Datia. See DUTTEEAH.

Datiscin, da-tis'sin, a substance yielded by the bastard hemp, *Datisca cannabina*, a common plant in gardens, indigenous to the Punjab, and largely used in the south of Europe and in Asia for dyeing yellow. It can be extracted from the leaves and roots by exhausting with alcohol, concentrating, adding water, filtering from a resin, crystallizing and purifying the glucoside so obtained. When pure it forms colorless silky needles, which are readily soluble in alcohol, sparingly in ether and in water, and have a bitter taste. It has feeble acid properties, and gives yellow compounds with lead and tin which can be used as dyes. When boiled with dilute acids it is resolved into sugar and *datiscetin*, which crystallizes readily. It is soluble in alcohol and in ether, almost insoluble in water. It also gives a fine yellow color when combined with lead.

Dative, in grammar, one of the cases of nouns and pronouns, the usual function of which is to mark the recipient of something given. In English there is no distinctive form for this case; yet when we say, for instance, "give me or him that," "I gave the man a crown," *me*, *him*, and *man* are really in the dative. In Latin, Greek, Sanskrit, German, etc., there are distinct forms for this case. See CASE.

Dattiya. See DUTTEEAH.

Dat'olite, dăt'o-lit, or **Dath'olite,** a basic silicate of boron and calcium, having the formula $H_2O.2CaO.B_2O_3.2SiO_2$, and crystallizing in the monoclinic system. Its crystals are glassy in appearance, white in color (often with a greenish tinge), and transparent or translucent. Before the blow-pipe it melts with intumescence, and gives a green color to the flame. Its hardness is from 5 to 5.5, and its specific gravity is about 3. In the United States it occurs in Connecticut, New Jersey, and the Lake Superior district. It is also found in the Salisbury Crags near Edinburgh, as well as in Norway, Sweden, and other parts of the European continent. The name is from two Greek words that refer to the tendency that one of its massive varieties exhibits, to divide into granular portions. The crystals when polished are used as ornaments.

Datura, da tū'ra, a genus of plants of the potato family (*Solanaceæ*). It contains about 125 species, widely distributed. The genus is represented in the United States by coarse weeds naturalized from tropical America. Jamestown or Jimson weed (*D. stramonium*) is said to have received its name from a poisoning that occurred from its use by the settlers of Jamestown, Va. It is also called thorn-apple. It is found in waste places from the eastern seaboard west to Minnesota and Texas. The purple thorn-apple or purple stramonium (*D. tatula*) is found throughout the same region as the Jimson weed, but the entire-leaved thorn-apple (*D. metel*) does not grow far from the Atlantic coast. An extract from these plants is used in medicine. When taken internally it is a powerful narcotic; medically it is used in mania, convulsions, epilepsy, tic-douloureux, etc. When smoked it palliates the symptoms in asthma. *D. tatula* and *metel* are similarly used. The seeds of these two latter species are said to have been used to produce the frenzied ravings of the priests in the Delphic and some other temples. The Peruvians use for the same purpose *D. sanguinea*, manufacturing from it also an intoxicating beverage.

Datu'rine, a poisonous alkaloid found in the thorn-apple (*Datura stramonium*), and now known to be identical with atropine (q.v.).

Daub, dowp, **Karl,** German Protestant theologian: b. Cassel, Germany, 20 March 1765; d. Heidelberg, Baden, 22 Nov. 1836. Professor of theology at Heidelberg from 1795. His works include 'Lehrbuch der Katechetik' (1801); 'Theologumena' (1806); 'Die Dogmatische Theologie jetziger Zeit' (1833), etc.

Dauban, Jules Joseph, zhül zhō'zĕf dō-băń, French painter: b. Paris 31 May 1822. He was a pupil of Auguste Debay. His taste led him to historical and religious subjects, and his compositions, severe in design and of a great simplicity in the accessories, are somewhat cold and sober in color. He became director of the museum and the School of Fine Arts in Angers in 1849, received a medal in 1864 and the decoration of the Legion of Honor in 1868. Among his works are: 'Louis XI. presenting Guillaume de Cerizay as Mayor of Anjou' (1861); 'Reception of a Stranger by the Trappists' (1864), Luxembourg Museum; 'Trappists Exchanging the Kiss of Peace before Communion' (1865), Museum of Angers; 'Madame Roland Going to the Revolutionary Tribunal' (1869); 'Fra Angelico da Fiesole' (1873); and several portraits and decorative paintings.

Daubenton, Louis Jean Marie, loo-ē zhŏń mä-rē do-bań-tōń, French naturalist and physician: b. Montbard Côte-d'-Or, France, 29 May 1716; d. Paris 31 Dec. 1799. He became celebrated for his participation in the Natural History of Quadrupeds by his friend Buffon; the anatomical part of which was prepared by Daubenton with great accuracy, clearness, and sagacity. In 1744 he was chosen member of the Academy of Sciences, and enriched its publications by a number of anatomical discoveries, and also by researches concerning the species of animals and their varieties, the improvement of wool, and the treatment of the diseases of animals. He threw much light upon mineralogy, botany, and agriculture, and proposed a new method for the classification of minerals. He was the author of numerous works of general utility: for example, 'Instruction pour les Bergers' (1782); 'Mémoire sur les Indigestions,' and many others. He became professor of natural history in the College of Medicine in 1778, and about seven years after professor of mineralogy in the Museum of Natural History. Dur-

ing the Reign of Terror, when every one was required to give some evidence of patriotic spirit, he was represented to his section as employed in introducing the Spanish sheep into France.

Daubeny, dâ'bē-nĭ or dō'bʼnĭ, **Charles Giles Bridle,** English scientist: b. Stratton, Gloucestershire, 11 Feb. 1795; d. Oxford 12 Dec. 1867. He was educated at Winchester College and Magdalen College, Oxford, and practised for some years as a physician in Oxford. In 1818 he visited Anvergne, and in 1837 made a scientific visit to the United States. In 1822 he was admitted a Fellow of the Royal Society, and from 1822 to 1855 was professor of chemistry in the University of Oxford. In 1834 he became professor of botany, and in 1840 of rural economy in the same university. He held the last appointment till his death. His principal works are: 'A Description of Active and Extinct Volcanoes' (1826); 'An Introduction to the Atomic Theory' (1831; with a supplement, 1840); 'Report to the British Association on Mineral and Thermal Waters' (1836); 'Lectures on Agriculture' (1841); 'Sexuality of Plants' (1860); 'Climate' (1863).

D'Aubigné, Jean Henri Merle, zhŏñ ŏñ-rē mĕrl dō-bēn-yā, Swiss ecclesiastical historian: b. Eaux-Vives, near Geneva, Switzerland, 16 Aug. 1794; d. Geneva 21 Oct. 1872. In 1818 he became pastor of the French Protestant Church in Hamburg. In 1823 he was appointed court-preacher at Brussels; but after the revolution of 1830 returned to Geneva, and filled the chair of Church history in its theological seminary until his death. The work which has given him a widespread reputation is his 'Histoire de la Réformation au Seizième Siècle' (1835–53); it has been translated into most European tongues, and has attracted more notice abroad than at home; it is written with a devout, fervid sympathy that is often eloquent, although the narrative is too graphic to be everywhere exact. Its popularity has been very great. Among his other writings are: 'Germany, England, and Scotland' (1848); a vindication of Cromwell (1848); 'Trois Siècles de Lutte en Ecosse' (1849); and 'Histoire de la Réformation en Europe au Temps de Calvin' (1862–78).

D'Aubigné, Merle. See D'Aubigné, Jean-Henri Merle.

D'Aubigné, Théodore Agrippa. See Aubigne, D'.

Daubigny, Charles François, shärl frăñ-swä dō-bēn-yē, French landscape painter and etcher: b. Paris 15 Feb. 1817; d. there 19 Feb. 1878. He studied under his father, who was a miniature painter, Paul Delaroche, and others; and from 1838 exhibited in the Salon, though his full recognition came only after the artist had reached his 50th year. He devoted himself to close and sympathetic study from nature, working much on the Seine in a house-boat, and developed a style of landscape art marked by singularly unaffected fidelity and originality. In 1853 he gained a first-class medal with his 'Pool of Gylien.' In 1857 he produced his 'Springtime'; in 1861 'The Banks of the Oise'; in 1872 'Windmills at Dordrecht'; and in 1877 his large and very impressive 'Rising Moon.' His 'Sluice in the Valley of Optevoz' (1855), and his 'Vintage' (1863), are in the Luxembourg Gallery. His is also known as a book-illustrator and as a vigorous etcher, having produced over 100 plates, some reproductions, others direct from nature, marked by great frankness of method and free painter-like quality. See Henriet, 'Daubigny et son œuvre' (1878); Van Dyke, 'Modern French Masters' (1896); Stranahan, 'History of French Art' (1900).

D'Aubusson, Pierre. See Aubusson, Pierre d'.

Daucus, dâ'kŭs, the typical genus of the *Umbelliferæ* or carrot family. The genus has about 25 species, two of them growing wild in America. Wild carrot, crow's-nest, or Queen Anne's lace (*D. carota*), is generally a pernicious and abundant weed throughout the Union. It is a native of Asia, naturalized from Europe. It is the original of the cultivated carrot. See Carrot.

Daudet, Alphonse, ál fôñs dō-dā, French novelist: b. Nimes 13 May 1840; d. Paris 16 Dec. 1897. He was educated at the Lyons Lycée, and for two years after leaving it supported himself as an usher at Alais. Going to Paris in 1857 he took to writing verse, his first volume being 'Les Amoureuses' (1858), which met with some success. This was followed by other poems, including 'La Double Conversion' (1859), and at this time he also contributed to the 'Figaro,' and other journals. About 1862 he began writing for the stage, and during the succeeding 10 years or so several dramas by him were represented, but with only moderate success. These included: 'La Dernière Idole' (1862); 'L'Œillet Blanc' (1865), and 'Le Frère Aîné (1868). Greater public favor was accorded to his 'Lettres de Mon Moulin,' which appeared in 1866 in a Parisian journal. In 1872 he produced his celebrated 'Les Aventures Prodigieuses de Tartarin de Tarascon,' an amusing satire on the boastfulness so characteristic of the south of France. From this time he published numerous works, some of the best being: 'Fromont Jeune et Risler Aîné' (1874); 'Jack' (1876); 'Le Nabab' (1877); 'Les Rois en Exil' (1879); 'Numa Roumestan' (1881); L'Evangéliste' (1883); 'Sapho' (1884); 'Tartarin sur les Alpes' (1885), a sequel to 'Les Aventures Prodigieuses'; 'Trente Ans à Paris' (autobiographical), (1887); 'Souvenirs d'un Homme de Lettres' (1889); 'Port Tarascon, dernières Aventures d'Illustre Tartarin' (1890); 'Rose et Ninette' (1892); 'La Menteuse' (1893); 'Entre les Frises et la Rampe' (1894); 'La Petite Paroisse' (1895); 'Contes d'Hiver' (1896); 'L'Enterrement d'une Etoile' (1896); 'Les Mères' (1896); 'Le Trésor d'Arlatan' (1897); 'La Fédor' (1897); and 'Soutien de Famille' (1897). M. Daudet has often been compared with Dickens in his mastery of pathos and humor. Some of his principal works rely mainly on his great powers of caricature for their success. His chief works have been translated into English and in this dress have been very popular. See Brunetière, 'Le roman naturaliste' (1896).

Daudet, Ernest Louis Marie, ėr-nā loo-ē mä-rē, French novelist: b. Nimes 31 May 1837. He is a brother of Alphonse Daudet (q.v.). His most notable novels are: 'The Venus of Gordes'; 'The Bloom of Sin'; 'Martha.' He

is author of an autobiographical sketch, 'My Brother and Myself' (1882); and has written some [illegible] sketches, as a 'History of the Revival Conferences in the South During the Revolution' (1881); 'History of the Emigration' (1880); 'Les Bourbons et la Russie pendant la Revolution Française' (1888).

Daughter of the Confederacy. See DAVIS, VARINA ANNE JEFFERSON.

Daughters of the American Revolution, a society composed of women who are descendants of ancestors, any of whom "with unfailing loyalty rendered material aid to the cause of independence as a recognized patriot, as soldier or sailor, or as a civil officer in one of the several colonies or States." It was organized in Washington, D. C., 11 Oct. 1890.

Daughters of the Confederacy, United, an association of the widows, wives, mothers, sisters, and lineal female descendants of men who served honorably in the army and navy of the Southern States, or who gave personal services to the Confederate cause. It was organized at Nashville, Tenn., 10 Sept. 1894.

Daughters of the Holland Dames, a colonial society of women, the official title being 'The Daughters of Holland Dames, Descendants of the Ancient and Honorable Families of New York,' was incorporated for the purpose of erecting a memorial to commemorate the early Dutch period of our colonial history, and to preserve and collect historical documents relating to the same. The headquarters are in New York. This society is not connected with the Holland Dames.

Daughters of the King, a Protestant Episcopal order of women (not to be confounded with the King's Daughters), organized in 1885. The aim of the society is to bring young women within the influence of the Church and to co-operate with the rectors of parishes to that end. President, Mrs. E. A. Bradley. The office of the council is in New York.

Daughters of the Revolution, a patriotic society of women in the United States, organized in 1891. Eligibility to membership is restricted to "women who are lineal descendants of an ancestor who was a military or naval or marine officer, soldier, sailor, or marine, in actual service under the authority of any of the 13 Colonies or States, or of the Continental Congress, and remained always loyal to such authority, or descendants of one who signed the Declaration of Independence, or of one who as a member of the Continental Congress or of the Congress of any of the Colonies or States, or as an official appointed by or under the authority of any such representative bodies, actually assisted in the establishment of American independence by service rendered during the War of the Revolution, becoming thereby liable to conviction of treason against the government of Great Britain, but remaining always loyal to the authority of the Colonies or States.' There are numerous subordinate State organizations.

Daughters of 1812. See UNITED STATES — DAUGHTERS OF 1812, NATIONAL SOCIETY OF.

Daulatabad, dow-lāt-ā-bād' ("fortunate city"), India, a town and fort in the Deccan, within the Nizam's dominions, 28 miles northwest of Hyderabad. The fortress consists of a conical rock, 600 feet high, with a wide ditch and an outer wall nearly three miles in circumference. The place surrendered to the Mohammedans in 1294, and Shah Muhammad Tughlak (1324–51) thrice attempted to remove the seat of government hither from Delhi. The fortress has not been garrisoned now for many years, and the town has greatly decayed. Pop. 1,243.

D'Aulnoy, dōl'nwā, **Marie Catharine Jumelle de Berneville,** zhu-mēl de bār-ne-vēl, COUNTESS, French writer: b. about 1650; d. 1705. She wrote many romances, long consigned to safe oblivion, but her fame rests securely on her 'Fairy Tales,' written in a simple, bright, and charming style, not altogether unworthy of Perrault. 'The White Cat,' the 'Yellow Dwarf,' 'Finette Cendron,' and 'Le Mouton' have for two centuries been naturalized in the nurseries of Europe, and are still familiar figures in pantomime. Her altogether delightful 'Travels in Spain' was reissued in New York in 1898.

Daumer, Georg Friedrich, gā'ōrg frēd-rĭĭt dow'mĕr, German writer: b. Nuremberg 5 March 1800; d. Würzburg 14 Dec. 1875. He underwent some remarkable revolutions of thought concerning religion; in his student days leaned strongly to Pietism; next was the declared foe of the Christian religion; and about 1859 embraced Catholicism and became one of its foremost champions. He wrote among many other philosophical tractates: 'Hints Toward a System of Speculative Philosophy' (1831); to his second period belongs: 'The Fire and Moloch Worship of the Hebrews' (1842); to his third: 'My Conversion' (1859). Of his poetical works, the 'Flowers of Song from Hafiz' may be named — a very beautiful transcription of the Oriental poet, with free variations in the very spirit of Hafiz himself. He wrote also 'Beautiful Souls: a Little Wreath of Legends and Poems' (1862); 'Legends and Poems of St. Mary.'

Daumier, Honoré, ō-nō-rā dō-mē-ā, French caricaturist: b. Marseilles 26 Feb. 1808; d. Valmondois 10 Feb. 1879. Fashion, tittle-tattle, scandal, politics, blemishes of figure, and oddities of character in turn inspired his inexhaustible genius for mockery. Few among his illustrious contemporaries escaped his pencil, and his caricatures had always some strikingly truthful feature about them. He made his début in the 'Charivari,' in a series of sketches from 'Robert Macaire'; and the revolution of 1848 suggested two of his most remarkable series, 'Parliamentary Idylls' and 'The Representatives Represented.' In his old age Daumier became blind, and was befriended by Corot, the landscape painter. See Alexandre, 'Honoré Daumier, l'homme et son œuvre' (1890).

Daun, Leopold Joseph Maria, lā'ō-pold yō'sĕf mä-rē'ä down, COUNT VON, Austrian general: b. Vienna 25 Sept. 1705; d. 5 Feb. 1766. He served in the Turkish war in 1710; as major-general in Italy in 1734; and distinguished himself at the battle of Krotzka in 1737, and the capture of Dingelfingen in 1740. In 1748, after serving against the French in the Netherlands, he was made Knight of the Golden Fleece. He

defeated Frederick the Great at Kolin in 1757, and again at Hochkirch in 1758.

Dauphin, dâ'fĭn, Fr. dō-făñ, the title of the eldest son of the king of France. Dauphin was originally a title held by several of the feudal lords of France, and is believed to have originated from the dolphins (Fr. *dauphin*) worn on their helmets or used as a family crest. In 1349 Humbert II., dauphin of Viennois, being childless, transferred his estate, called the Dauphiny (*le Dauphiné*), in the south of France, to Philip of Valois, on condition that the eldest son of the king of France should in future be styled the dauphin, and govern this territory. The dauphin, however, retained only the title, the estates having been united with the crown lands. On the death of the dauphin his eldest son inherited this title; if he had no son his eldest brother succeeded him. If the king had no son, as was the case in the reign of Louis XVIII., the title of dauphin was not bestowed on any one; for it was never given to the next prince of the blood and presumptive heir, even if he were the king's brother. The wife of the dauphin was called dauphiness (*dauphine*). The *Delphin* classics were editions made for the use of the dauphin (*in usum delphini*).

Dauphiné, dō-fēn-ā, one of the ancient provinces of France. It was divided into Upper and Lower Dauphiné. It forms the departments of the Isère, the Hautes Alpes, and part of that of the Drôme. The capital of the whole was Grenoble. The province constituted a sort of triangle, bounded north by Bresse and Savoie, east by Piedmont, south by Provence, and west by the Rhone.

Daurat, Jean, zhŏñ dō-rä, French scholar: b. about 1510; d. 1588. He became president of the College Coqueret, where he superintended the studies of Ronsard, Du Bellay, Baif, and Belleau. These poets he carefully trained for the task of reforming the vernacular, and ennobling French literature by the imitation of Greek and Latin models. He wrote nothing of importance in French, but devoted himself to guiding and stimulating the other members of the Pléiade, in whose works his learning and enthusiasm bore rich and enduring fruit.

Dauw, dâ, or **Peechi** (*Equus burchelli*), an animal closely resembling the zebra, which inhabits the plains of southern Africa, particularly to the north of the Orange River. It is about the size of an ass, but more delicately formed. Its general color is a pale brown, with grayish-white on the abdomen and inner parts of the limbs. Its head, neck, and body, and the upper parts of its limbs are striped like the zebra, but the stripes are not so dark in color. It migrates periodically in search of food, and in times of scarcity visits the cultivated lands and makes havoc of the crops. It has been tamed to some extent, but its temper cannot be relied on. The Dutch colonists call it Bonte-quagga. It is known also as Burchell's zebra. See ZEBRA.

Davao, dä-vä'ō, Philippines, a province in the southeastern part of the island of Mindanao; area 8,976 square miles; with dependent islands 9,171 square miles. Most of the communication between towns and villages is by sea, as almost all are on the coast; there are a few roads, and the United States troops have done much to improve them. Hemp, coffee, tobacco, rice, and corn are cultivated; the cinnamon tree, the betel nut, cloves, and nutmeg grow without cultivation; large numbers of horses, cattle, and hogs are raised. There are indications of deposits of coal and some gold, and there are many valuable forests. Davao was occupied by United States troops in December 1899, and was given civil government in 1903.

Dav'enant, Sir William, English poet and dramatist: b. Oxford February 1606; d. London 7 April 1668. He was employed in preparing several masques for the entertainment of the court; and on the death of Ben Jonson in 1637, succeeded to the vacant laurel. On hostilities breaking out between Charles I. and the Parliament, Davenant displayed his attachment to the royal cause. At the siege of Gloucester in 1643, he was knighted by the king; and on the decline of the royal cause retired to France, where he became a Roman Catholic, and began the composition of his principal work, a heroic poem, entitled 'Gondibert.' An attempt which he afterward made to lead a French colony to Virginia had nearly proved fatal to him. The ship in which he had sailed from Normandy was captured by a cruiser in the service of the English Parliament, and carried into the Isle of Wight, where Davenant was imprisoned in Cowes Castle. In this forlorn captivity, from which he had but little hope of escaping alive, he composed the third book of 'Gondibert.' In October 1650 he was removed to London for trial before the high commission court. His life is said to have been preserved by the interposition of Milton. There is a corresponding tradition, that Davenant repaid the good offices of Milton by protecting the republican poet after the Restoration. On the return of Charles II. to England the stage was re-established with renewed splendor, and Davenant became patentee of a theatre in Lincoln's Inn Fields. He continued to employ his pen and his talents as a theatrical writer and manager till his death. He was buried in Westminster Abbey. His works consist of dramas, masques, addresses, and the epic 'Gondibert,' which was never finished; but he is remembered chiefly by the reconstruction of Shakespeare's 'Tempest,' in which he was engaged along with Dryden, a work which long held the stage in place of the original, although unequivocally condemned by modern criticism as a vulgar and degraded version of a drama which stood in need of no such emendation.

Dav'enport, Charles Benedict, American zoologist: b. Stamford, Conn., 1 June 1866. He was graduated from Harvard in 1889; is a director of the biological laboratory of the Brooklyn Institute of Arts and Sciences, and in 1899 was appointed professor of zoology at the University of Chicago. He has written: 'Experimental Morphology' (1897–9); 'Statistical Methods in Biological Variation' (1899); and 'Introduction to Zoology' (with G. C. Davenport, 1901).

Davenport, Cyril James, English librarian: b. Stirling, Scotland, 5 June 1848. He has been a librarian in the British Museum since 1868 and has published: 'The English Regalia' (1897); 'Royal English Bookbindings' (1897); 'Cantor Lectures on Decorative Bookbindings'

1881), 'Pug's Embroidered Bookbindings' (1889), 'Cartoon Lectures on Cameos' (1900), 'Life of C. Bartlett' (1900); 'Personal Jewelry' (1902).

Davenport, Edward Loomis, American actor: b. Boston, 15 Nov. 1814; d. Canton, Pa., 1 Sept. 1877. His first appearance was made in 1836 at Providence, R. I., as Parson Will in 'A New Way to Pay Old Debts,' with Junius Brutus Booth as Sir Giles. In 1838 he played in Philadelphia. He soon became a leading performer in comedy, melodrama, and tragedy. Up to 1847 he appeared chiefly in Boston. In that year he went to England with Mrs. Mowatt, there playing Claude Melnotte in 'The Lady of Lyons,' with Mrs. Mowatt as the Pauline. For two seasons he supported W. C. Macready. In 1854 he returned to the United States, where he traveled extensively, playing especially Shakespearean parts and those in dramatizations of Dickens. As Brutus in 'Julius Cæsar' and Bill Sykes in 'Oliver Twist' he was equally successful. Among his other characters were Sir Giles Overreach and Hamlet. In 1859 he became manager of the Howard Athenæum, Boston, in 1869 of the Chestnut Street Theatre, Philadelphia. His versatility and finish were notable. Consult Edgett, 'E. L. Davenport' (1901; Dunlap Society Pub., new series, No. 14).

Davenport, Eugene, American agriculturist and educator: b. Woodland, Mich., 20 June 1856. He was professor of agriculture in the Michigan Agricultural College in 1889–91, and president of the agricultural college at São Paulo, Brazil, in 1891–2. In 1895–1901 he was professor of animal husbandry in the University of Illinois. In September 1901 he became dean of the College of Agriculture of that institution, director of the Agricultural Experiment Station, and professor of thremmatology. He has contributed to the agricultural press and the bulletins of the experiment stations of Illinois and Michigan.

Davenport, Fanny Lily Gypsy, American actress: b. London 10 April 1850; d. Duxbury, Mass., 26 Sept. 1898. Her first appearance on the stage was at the Howard Athenæum in Boston, then under the management of her father, E. L. Davenport (q.v.). She played during her career in the theatres of all the large cities in the United States. Her most noted roles were in 'La Tosca,' 'Gioconda,' 'Fedora,' and 'Cleopatra.' She was married in 1879 to Edwin H. Price, but was divorced and subsequently married Melbourne McDowell, an actor of leading roles in her company.

Davenport, Franklin, American legislator: b. Philadelphia, Pa.; d. Woodbury, N. J., about 1829. He studied law, and, having been admitted to the bar, practised at Woodbury, N. J. In the Revolution he was a captain of artillery in Newcomb's New Jersey brigade, and also stationed at Fort Mifflin. In 1794, at the time of the "Whiskey Insurrection," he marched with the troops to Pittsburg as colonel of the New Jersey line. He was appointed United States senator to fill a vacancy, serving in 1708–9, and was a representative in Congress in 1799–1801.

Davenport, Herbert Joseph, American educator and publicist: b. Wilmington, Vt., 10 Aug. 1861. He was educated at the University of South Dakota, and the Harvard Law School, and is now (1903) principal of the high school at Lincoln, Neb. He has published: 'Outlines of Economic Theory' (1896); 'Elementary Economic Theory' (1898); 'Principles of Grammar' (with Emerson, 1898).

Davenport, Henry Kallock, American naval officer: b. Savannah, Ga., 10 Dec. 1820; d. Franzensbad, Bohemia, 18 Aug. 1872. He entered the navy in 1838, and in 1844, as passed midshipman, became connected with the coast survey. In 1847–53 he was in the mail-steamship service, subsequently was on sea duty with various squadrons, and in 1850 participated in the capture of the Barrier forts, Canton River, China. During the Civil War he commanded the steamer Hetzel in 1861–4, being in 1862–4 senior officer in command of the sounds of North Carolina. Promoted captain in 1868, he was assigned to the command of the Congress of the European squadron in 1870.

Davenport, Homer Calvin, American artist and cartoonist: b. Silverton, Ore., 8 March 1867. Without schooling or art education, and after many vicissitudes as jockey, circus clown, and railroad stoker, he was employed by the San Francisco *Examiner* in 1892 and since then has been engaged upon the staff of the *American and Journal*, the *World*, and the *Evening Mail* of New York. He has also appeared as a lyceum lecturer. He has published: 'Davenport's Cartoons'; 'The Bell of Silverton, and Other Short Stories of Oregon'; 'The Dollar or the Man.'

Davenport, Ira, American politician: b. Hornellsville, N. Y., 28 June 1841; d. Bath, N.Y., 6 Oct. 1904. After graduating from Yale College he went into business and in 1877 was elected to the New York senate and re-elected in 1879. During both terms he served as chairman of the committee on commerce and navigation. He was elected comptroller of the State of New York in 1881, and after retiring from that office served two terms as member of Congress. He was the Republican candidate for governor of the State of New York in 1885, but was defeated by D. B. Hill, after which time he retired from politics.

Davenport, John, American Puritan clergyman: b. Coventry, England, 1597; d. Boston, Mass., 15 March 1670. Educated at Oxford, he became chaplain of Hilton Castle, near Durham, later was made minister of Saint Stephen's Church, London (1616–33), and there attained a considerable reputation as a preacher. His Puritanical principles and views ere long brought him into conflict with Archbishop Laud, and in 1633 he withdrew from the English Church, and removed to Holland, where he became colleague of the Rev. John Paget, pastor of the Puritan church at Amsterdam. In 1636, however, he returned to England, where he was very active in obtaining the charter of the Massachusetts colony. He arrived in Boston in June 1637, sat with the synod of Cambridge in August, and in March 1638 sailed with the band of colonists that founded New Haven (Quinnipiac). Here he was extremely influential in civil as well as ecclesiastical affairs. He was minister there for 30 years, and aided in establishing the system of civil polity, which began by the declaration that "all of them would be ordered by the rules which

the Scriptures held forth to them." On 4 June 1649, holding their constituent assembly in a barn, the "free planters" resolved that church members only should be burgesses, and Davenport was chosen one of the "seven pillars" to support the ordinance of civil government. He exhorted the governor to judge justly, and the "cause that is too hard for you to bring it to me." Annual elections were ordained, and God's word established as the only rule in public affairs. In his carefulness in regard to the admission of members to the Church, he held in reality also the keys of all political power. When the messengers of the king, who had come to New England in pursuit of Goffe and Whalley, the regicide judges of Charles I., approached New Haven, he hid the fugitives in his house, and preached to his congregation from Isaiah xvi. 3 and 4: "Hide the outcasts: bewray not him that wandereth. Let mine outcasts dwell with thee, Moab: be thou a covert to them from the face of the spoiler." After the death of Wilson, the pastor in Boston, in 1667, he removed there to succeed him. He was installed in December 1668. His election caused a division in the congregation. Those who opposed his views on the "half-way covenant" withdrew and organized the Old South Church. The controversy went on for many years. Among his publications are: 'Discourse About Civil Government in a New Plantation Whose Design is Religion' (1663); 'The Knowledge of Christ Indispensably Required of All Men Who Would be Saved' (1653); 'A Catechism Containing the Chief Heads of Christian Religion' (with Hooke 1659); 'The Saints' Anchor-Hold' (1661); 'The Power of Congregational Churches Asserted and Vindicated' (1672). He was also an editor of the works of Dr. John Preston, for some time leader of the English Puritans. Consult: Mather, 'Magnalia' (1702), and Dexter, 'Sketch of the Life and Writings of Davenport' ('Papers' of the New Haven Colony Hist. Soc., Vol. II., 1877).

Davenport, Robert, English poet and dramatist: flourished about 1623; d. after 1640. He is known only through his 'A Crowne for a Conqueror, and Too Late to Call Backe Yesterday. Two Poems, the One Divine, the Other Morall' (1623); 'King John and Matilda' (1655), a tragedy; and two comedies: 'A New Trick to Cheat the Divell' (1639), and 'The City Night Cap' (printed 1661). That he was associated with Shakespeare in producing parts 1 and 2 of 'Henry VI.' seems established, and it is almost certain that he is the author of a play called 'The Pirate.'

Davenport Brothers. Ira E. (b. 1839) and William H. (b. 1841). So-called "mediums," who professed to be adepts in spiritistic arts, and who, by their skill in performing various feats and their clever deceptions gained many followers. They flourished in 1845–65, but were finally exposed as impostors. Consult Abbot, 'The Davenport Brothers' (1864) and Barkas, 'Lecture on the Brothers Davenport' (1864). See Spiritualism.

Davenport, Ia., a city of Scott County, of which it is the county-seat, on the western bank of the Mississippi, opposite Rock Island, Ill., 330 miles above Saint Louis, and 184 miles west by south of Chicago; on the Burlington, Cedar Rapids & Northern, the Chicago, Milwaukee Saint Paul, the Chicago, Rock Island & Pac and other railways. It is pleasantly situate the foot of the Upper Rapids of the Mississ on the slope of a steep bluff which extends 3 miles along the river and commands an ex sive view. It is connected with the Illinois s by an iron railway and carriage bridge, buil part by the Federal government, and cos $1,200,000, and an iron railway bridge cos $800,000. On Rock Island, which is crosse the former structure, are the central U States arsenal and armory, military headq ters, and other government buildings.

Industries, etc.— The census of 1900 sh 416 establishments here, with a capital of $ 774,707, employing an average number of 4 persons at wages amounting to $1,892,737; of materials used, $6,854,677; value of produ $11,573,670. The surrounding region is im tant both agriculturally and for its coal mi Davenport ships large quantities of farm duce, river-packets from Saint Paul to S Louis furnishing means of transportation in dition to that of the railways. The flour grain business is an important one. Among numerous manufactured products are lum and planing-mill products, brick and stone, b and other bakery products, carriages and wag agricultural implements, woolen goods, glu and its products, foundry and machine-s products, cordage, pottery, furniture, cigars, cooperage products. Wholesale slaughtering meat-packing is also carried on here.

Public Institutions, Buildings, etc.— Da port has an Academy of Natural Sciences, organization having been begun 14 Dec. 1 Saint Luke's, Mercy, and other hospitals; a p lic library; two opera-houses; a Masonic ten and other important buildings. It is the sea Saint Ambrose College and other educational stitutions, and of the State Orphanage; and an episcopal see of the Roman Catholic Chu and the Protestant Episcopal Church. Academy of Natural Sciences regularly p lishes 'Proceedings,' and has a large scien library and a fine collection of mound-bui relics.

History, Government, etc.— Davenport founded in 1835, in the autumn of which ye company, led by Col. George Davenport, a resident on Rock Island, was formed for purchase of a site. In 1838 it was incorpora as a town, and in 1851 a city charter was tained from the legislature and adopted. Chicago & Rock Island Railway was charte in 1851 and completed in February 1854. government is by a mayor, biennially elec and a city council, comprising the mayor aldermen elected by wards and at large. annual income is about $540,000; the expe iture is $500,000. Pop. (1890) 26,872; (19 35,254.

Davey, Richard Patrick Boyle, Eng journalist: b. 1848. He began his career in in New York, where he edited 'The Spirit the Times'; and returning to England in has since been connected with various Lon journals as literary and dramatic critic. has published: 'Sand Sea'; 'A Royal Amo (1881); 'Weatherleigh' (1894); 'The Su and His Subjects' (1895); 'Victoria: Qu and Empress' (1897); 'Mary Tudor' (189

('[illegible] Past and Present' (1848); 'Life of Lady Jane Grey' (1848); 'Historical London' (1851); 'Lucrezia Borgia' (1903). He is also the author of the plays, 'Paul and Virginia' (1876); 'Lucie' (1880); 'Inheritance,' produced in New York and played 1,500 times; 'Sweet Nell of Old Drury' (1893); 'Marion de l'Orme' (1894). He has lectured both in England and the United States.

David (Heb. 'beloved'), king of Israel. He was the youngest son of Jesse, a citizen of Bethlehem, and member of the tribe of Judah. His life is recorded in the first and second books of Samuel and the first book of Chronicles. The book of Psalms, a large portion of which was composed by him, also contains frequent allusions to incidents in his life, evidently introduced for allegorical purposes, and often supposed to apply prophetically to the Messiah, of whom David was an ancestor. During Saul's life, and in consequence of his disobedience to the divine commands, the prophet Samuel was sent to anoint David, who then kept his father's flocks as king of Israel. David was afterward recommended to Saul for his skill in music, and played before him to soothe a melancholy distemper to which the king was subject. On the breaking out of war he was sent home, but being sent by his father to inquire after his brothers in the army he slew Goliath, a Philistine giant, who had defied the armies of Israel. Saul again took him to court, but exhibited extreme jealousy of him, and frequently tried to kill him. David escaped through the connivance of Jonathan, Saul's eldest son, who had formed a strong attachment for him. He now became the master of a band, composed in great part of lawless characters, but whom he seems to have disciplined and kept in subordination. He was pursued and persecuted by Saul during a great part of the remainder of that monarch's life. On the death of Saul he was crowned king of Judah at Hebron, and seven years afterward, at the close of a successful war with Ishbosheth, Saul's successor, was acknowledged king of all Israel. He reigned after this for 33 years, extending the dominions of the kingdom of Israel by conquests over the Philistines, Amalekites, Edomites, Moabites, Ammonites, and Syrians. Although generally a just and merciful prince, he committed an act of great oppression in taking possession of the wife of Uriah, one of his officers, and directing Joab, the captain of the host, to abandon Uriah at the siege of Rabbah, and permit him to be killed. For this the prophet Nathan predicted great calamities to his family and kingdom, and it was soon followed by the rebellion and death of his favorite son Absalom. Another of his sons, Adonijah, rebelled near the close of his reign. David's penitence for this offense is expressed in several beautiful psalms. He was succeeded by Solomon, his son by Bathsheba, the wife of Uriah. David made great preparations for the building of a temple at Jerusalem, which he had conquered from the Jebusites, but the work was by divine command transferred to his son Solomon, by whom it was carried out. David was born, according to Ussher, 1085 B.C., anointed king 1063, made king of Judah 1055, of Israel 1048, died 1015. Some modern authorities place his death earlier, others later. See PSALMS.

David, Saint (Welsh, DEWI), patron saint of Wales: d. 601. He was archbishop of Caerleon and afterward of Menevia, now Saint David's. He was celebrated for his piety, and many legends are told of his miraculous powers. Several theological treatises are ascribed to him.

David I. (often called ST. DAVID), king of Scotland: b. about 1080; d. Carlisle, England, 24 May 1153. He succeeded his brother, Alexander the Fierce, in 1124. He married Maud, grandniece of William the Conqueror; and was Earl of Northumberland and Huntingdon when called to the Scottish throne. On the death of Henry I., king of England, he maintained the claim of his daughter Maud against King Stephen, and seized Carlisle, but was defeated at the battle of Northallerton in 1138.

David II., king of Scotland: b. Dunfermline, Scotland, 5 March 1324; d. Edinburgh 22 Feb. 1371. He was the son of Robert Bruce (q.v.), and succeeded to the throne in 1329. On the death of his father he was acknowledged by the great part of the nation. Edward Baliol, however, the son of John Baliol, formed a party for the purpose of supporting his pretensions to the crown; he was backed by Edward III. of England. Battles were frequent, and at first Baliol was successful; but eventually David succeeded in driving him from Scotland. Still, however, the war was carried on with England with increasing rancor, till at length David was made prisoner at the battle of Neville's Cross (1346). After being detained in captivity for 11 years he was ransomed for 100,000 marks. The remainder of his reign was occupied in disputes with his parliament.

David, Armand, är'män dä-vēd, French abbé, naturalist, and missionary: b. Espeletta 7 Sept. 1826. He entered the congregation of the Lazarists in 1848, teaching the natural sciences for some time at Savone, and going, in 1862, to China, where he made an enormous collection of plants, minerals and animals, which he sent to the museum in Paris. In 1866 he undertook a new exploration, chiefly through Mongolia and eastern Tibet. In 1872 he made a third voyage to China, lasting two years. Besides the accounts of his journeys, appearing in the archives of the Museum under the title of 'Journal of My Third Voyage of Exploration in the Chinese Empire' (1875), he left many works on natural history, among which are: 'The Birds of China,' and 'Plantæ Davidianæ ex Sinorum Imperio' (1890).

Da'vid, Christian, Moravian missionary: b. Sinftleben, Moravia, 31 Dec. 1690; d. Herrnhut 3 Feb. 1751. In 1722 he was the leader of the Moravians who took refuge from persecution with Count Zinzendorf and founded their settlement at Herrnhut. In 1733 he went to Greenland, establishing the first mission there; he later made several visits to Greenland, as well as missionary journeys to Denmark, Holland, Livonia, and England.

David, dä-vēd, **Félicien Cesar,** French musician and composer: b. Cadenet, Vaucluse, 13 April 1810; d. Saint Germain, near Paris, 29 Aug. 1870. After some vicissitudes he entered the Paris Conservatoire in 1830, and became an ardent disciple of St. Simon, Enfantin, and other social speculators. In 1832, with a

few companions, he went to the East in order to realize his dreams of a perfect life, but returned disappointed in 1835. He then published his 'Mélodies Orientales,' and soon after his most successful work, the ode-symphony 'Le Désert' (1844). His other works include many compositions for strings and for the pianoforte, and 'Moïse sur le Sinai' (1846); 'Christophe Colombe' (1847); 'L'Eden' (1848); 'La Perle du Brésil' (1851); 'Herculaneum' (1859); and 'Lalla Rookh' (1863). His work abounds in felicitous and melodious expression, and is preeminently marked by the qualities characteristic of French music.

David, dä'vĕd, **Ferdinand,** German violinist: b. Hamburg 19 Jan. 1810; d. Kloster, Switzerland, 18 July 1873. He was a pupil of Spohr; made his debut in 1824; and was leader of Gewandhaus Concerts, Leipsic 1836. His works, which reach Opus 39, are principally for the violin. He was the friend of Mendelssohn and the teacher of Joachim and Wilhelmj.

David, Gheerardt, gā-rärt' dä'vĕt, Dutch painter: b. Oudewater about 1460; d. Bruges 13 Aug. 1523. In 1484 he entered the Painters' Guild of Bruges, of which he became dean in 1501. The National Gallery, London, contains an admirable example of his work in 'A Canon and His Patron Saints,' a wing from an altarpiece; and among his other pictures are a 'Madonna,' in the museum at Rome; a 'Crucifixion,' in Berlin; and a 'Baptism of Christ,' and a 'Descent from the Cross,' both at Bruges. See Conway, 'Early Flemish Artists' (1887).

David, Jacques Louis, zhäk loo-ē dä-vĕd, French painter: b. Paris 30 Aug. 1748; d. Brussels 29 Dec. 1825. After obtaining the grand prize in Paris he studied in Rome from 1775 to 1780, devoting himself particularly to historical painting. He visited Rome a second time in 1784, and finished his masterpiece, the 'Oath of the Horatii,' which Louis XVI. had commissioned him to design from a scene in the Horaces of Corneille. In the same year he painted his 'Belisarius'; in 1787, the 'Death of Socrates'; and in 1788, 'Paris and Helen.' He finished, in 1789, a large painting representing Brutus condemning his sons to death. He also furnished the designs of the numerous monuments and republican festivals of that time. In 1792 he was chosen an elector in Paris; afterward a deputy in the National Convention; and during the Reign of Terror was one of the most zealous Jacobins, and wholly devoted to Robespierre. He proposed to erect a colossal monument of the nation on the Pont-Neuf, from the materials of the king's statue. At the trial of Louis XVI. he voted for his death. In 1799 he executed the 'Rape of the Sabine Women,' from the exhibition of which he received, as it is said, 100,000 francs. In 1804 the emperor directed him to execute four pieces, among which the coronation of Napoleon was particularly distinguished. Among his finest works of this period were many representations of the emperor, particularly that in which Napoleon was represented on horseback, on Mount St. Bernard, pointing out to his troops the path to glory. This is often engraved. In 1814 David painted 'Leonidas,' his last painting in Paris. After the second restoration of Louis XVIII. he was included in the decree which banished all regicides from France. He then established himself at Brussels, where he died in exile. The opinions of the merits of this artist are various, but the praise of correct delineation and happy coloring is universally conceded to him. He found in the history of his time, in the commotions of which he took an active part, the materials of his representations. See Mather, 'History of Modern Art' (Vol. II. 1896); Stranahan, 'History of French Painting' (1899).

Da'vid, Laurent Olivier, Canadian journalist and author: b. Sault au Recollet, Quebec, 24 March 1840. He was educated at the College of Sainte Thérèse, and was admitted to the bar in 1864. He assisted in founding the paper 'Le Colonisateur,' 'L'Opinion Publique,' and the '*Le Bien Publique*.' In the latter he attacked the Roman Catholic clergy for their interference in political matters. In 1886 he was elected to the Canadian legislature from East Montreal, but declined renomination in 1890. He has written: 'Biographies et Portraits' (1876); 'Les Héros de Chateaugay' (1883); 'Les Patriotes de 1837–8' (1884); 'Les Deux Papineau' (1896); and 'Le Clergé Canadien: sa mission et son œuvre' (1896).

David, Pierre Jean, pē-ār zhŏń, French sculptor: b. Angers 1789; d. 5 Jan. 1856. He is commonly called David d'Angers. He became the pupil of J. L. David (q.v.), and his bas-relief of Epaminondas having gained the first prize for sculpture in 1811, he was enabled to go to Rome to perfect himself in his art. On his return to Paris he laid the foundation of his fame by a colossal statue of the great Condé in marble. In August 1826 he was nominated a member of the Academy of Fine Arts, and in December of the same year professor in the School of Painting and Sculpture. He executed busts of Goethe for Weimar, of Schelling for Munich, of Tieck for Dresden, of Rauch and Humboldt for Berlin. In 1831 he began the magnificent sculptures of the Pantheon, his most important work, which he finished in 1837. He executed a great number of medallions, busts, and statues of celebrated persons of all countries, among whom may be named Walter Scott, Canning, Washington, Lafayette, Guttenberg, Cuvier, Victor Hugo, Béranger, Paganini, and Madame de Staël. David worked with great rapidity and ease, and his chief strength consisted in his facility of invention and execution, especially in large works. In works of smaller size his drawing and modeling are seen to be deficient in fineness and accuracy.

David, dä-vēth', Colombia, South America, situated on the Isthmus of Panamà, in a fertile plain on the Rio David which enters the Pacific eight miles to the south. Stock-raising and the cultivation of tobacco are extensively engaged in, and there is a considerable trade. Pop. 9,000.

David Ap Gwilym, dä'vĕd ăp gwēl'ĭm, Welsh poet of the 14th century. There is a doubt about his dates, some authorities giving 1340–1400; others 1300–68. He had a good education and considerable knowledge of Italian and Latin. His tendency to keen satire was very unpleasant to his kinsmen and neighbors, and he was at one time forced to leave home on this account. To Morvydd, the lady whom he loved, he addressed nearly 150 poems; though she returned the poet's love she was forced into an

[illegible] with a wealthy man. David eloped with her, and the fine imposed on him by the husband was so heavy that he could not have paid it but for the assistance of the [illegible] of Glamorganshire. Over 250 of his poems were collected and published by Owen Jones (1789), and a translation published by Arthur James Johnes (1834). Others of his poems have been discovered in manuscript.

David City, Neb., the county-seat of Butler County, situated on the Union P., the B. & M., the L. E. & M. V. RR.'s, and about 45 miles northwest of Lincoln, the capital of the State. It is a trade centre for the populous agricultural region surrounding the city. Pop. 2,000.

David Balfour; Being Memoirs of His Adventures at Home and Abroad, a novel by Robert Louis Stevenson, published in 1893. A sequel to 'Kidnapped,' this novel opens with the attempt of David Balfour to effect the escape of his friend, Alan Stewart, from Scotland; and to aid Stewart's brother, unjustly imprisoned on a charge of murder. He falls in love with Catriona Drummond, is imprisoned, and after his release goes to Holland, where he lives with Catriona without marriage. Her father interfering, the two are separated; but by the intervention of Alan Stewart they meet again and are married. The novel is in the romantic vein, written with Stevenson's simplicity and clearness, and is artistic in construction.

David Copperfield, a novel by Charles Dickens, which was that author's favorite among his works, and was partly autobiographical in character. It is ranked among the greatest English novels. The hero's career is given from the day of his birth. At 10, he runs away from home, having been forced by a harsh stepfather to undertake rough daily work. He is adopted by his aunt, Miss Betsy Trotwood, an eccentric but kindly woman; and finally becomes an author. After the death of his "child wife," Dora Spenlow, he marries Agnes Wickfield, an almost ideal character.

Davidge, William Pleater, American actor: b. London, England, 17 April 1814; d. Cheyenne, Wyo., 7 Aug. 1888. He made his first appearance on the stage at the Drury Lane Theatre in London; after acting in various places in England, came to the United States in 1850. He took the part of Sir Peter Teazle at the old Broadway Theatre in New York, supported Forrest and other leading actors and took part in the Shakespearean revivals at the Winter Garden Theatre in 1867. In 1869–77 he was at Daly's Fifth Avenue Theatre; in 1879 he appeared as the original Dick Deadeye in 'Pinafore'; and in 1885 he became a member of the Madison Square Theatre Company. He played over 1,000 parts, among them Hardcastle in 'She Stoops to Conquer'; Croaker in 'Good Natured Man'; Caliban in 'The Tempest'; Nick Bottom in 'Midsummer Night's Dream'; and Old Gobbo in 'The Merchant of Venice.'

Davidists, the name given to two distinct religious sects, namely, the followers of David of Dinant in the 13th century, and those of David George or Joris in the 16th. David of Dinant was a contemporary of Almaricus of Bena (Amaury de Bène), and at the death of Amaury (1204) continued to teach Amaury's pantheistic doctrine, founded on Neoplatonism, that the "All is God." David taught that holiness is simply the consciousness of the presence of God, the thought that God is the "One and the All"; that he who attains the perfect view of the God-All cannot sin, no matter what enormities he commits; he is the Christ, he is the Holy Ghost. The other sect of Davidists, called also David-Georgians, after the name of their founder, who was born at Delft in 1501, had its rise in 1534. Its founder published in 1542 his 'Book of Wonders,' recounting his marvelous visions and divine revelations. But he retired from the leadership in 1544, and during the remainder of his life was a prosperous merchant at Basel, under an assumed name. By order of the senate of Basel, his body, as that of a heretic, was exhumed and burnt. The sect, with Henry Nicolas as its head, made progress in Holland and got a footing in England, being now known as Familists. The Familists taught as their chief tenet the gospel of love, divine love. Love, they held, is above all laws, whether ceremonial, moral, or civil, and the practice of the sectaries was so consonant with this doctrine that early in the 17th century the societies of Familists had to be suppressed in both countries, by the civil power.

Davids, Thomas William Rhys, English Oriental scholar: b. Colchester 12 May 1843. He was educated at the University of Breslau; from 1866 on filled judicial places in Ceylon and acted as archæological commissioner. In 1877 he was called to the London bar, and subsequently became professor of Pali and Buddhist literature in University College, London. Among his works are: 'Buddhism' (1877); translations of 'Buddhist Birth Stories' (1880); 'Buddhist Suttas' and 'Vinaya Texts' (1891), published in 'The Sacred Books of the East'; 'American Lectures' (1896); 'Sacred Books of the Buddhists; Dialogues of the Buddha' (1899); 'Buddhist India' (1902).

David's Deer (*Cervus davidianus*), a deer found in northern China and in Manchuria. It derives its name from Père David, a French Catholic missionary, who first saw it in the imperial park at Pekin. It resembles the Indian swamp-deer (q.v.), but has long, shaggy hair. It has no brow-tine. Little is known of its wild habits, for most of the representatives are found in parks and preserves in China or in Europe.

Davids Island, an island owned by the United States government and used for military purposes. It is in the waters of Long Island Sound, about 80 rods north of the limits of New York. Area about 100 acres.

Davidson, George, American astronomer: b. Nottingham, England, 9 May 1825. He came to the United States in 1832; graduated at the Central High School, Philadelphia, in 1845; and joined the United States Coast Survey. While in this service he was chief engineer of a party which surveyed a ship canal route across the Isthmus of Darien. He also made a geographical survey of the coast of Alaska in 1867. He traveled extensively in Egypt, China, India, and Europe, for purposes of scientific study, and also took charge of the telegraph-longitude work, and of the main triangulation and astronomical party carrying the geodetic work

across the continent. From 1877–84 he was regent of the University of California, and for many years was president of the California Academy of Sciences. He retired from the coast survey after 50 years of distinguished service, in 1895, and became professor of geography in the University of California.

Davidson, James Wheeler, American consul: b. Austin, Minn., 14 June 1872. He was a member of the Peary Arctic expedition to North Greenland 1893–4; war correspondent with the Chinese army 1895; and with the Japanese army 1895–6. In June 1898 he was appointed United States consul for Formosa and Loochoo Islands. He has published: 'Formosa Camphor and Its Future' (1896); 'The Island of Formosa: Past and Present' (1900).

Davidson, James Wood, American author: b. Newberry County, S. C., 9 March 1829. He was graduated from South Carolina College (now the State University) and taught Greek at the Mount Zion Collegiate Institute. During the Civil War he fought in the Confederate army as adjutant in Stonewall Jackson's army corps under Lee in Virginia. After the war he took up journalism, living in New York and Washington, and since 1887 has been in the Treasury Department at Washington. He has written: 'The Living Writers of the South' (1869); 'A School History of South Carolina'; 'The Correspondent' (1886); 'The Poetry of the Future' (1888); and 'The Florida of To-day' (1889).

Davidson, John, Scottish poet, novelist, and miscellaneous writer: b. Barrhead, Renfrewshire, 11 April 1857; d. 3 Aug. 1905. He was at first a teacher, but in 1890 adopted a literary career, writing for the 'Speaker' and other journals. He has published: 'Fleet Street Eclogues' (1893); 'A Random Itinerary' (1894); 'Ballads and Songs' (1894); 'Plays' (1894); 'Earl Lavender' (1895); 'New Ballads' (1896); 'The Last Ballad and Other Poems' (1898); 'The Testament of a Man Forbid' (1901); 'The Testament of an Empire Builder' (1902); and two novels: 'Perfervid' (1890); and 'Baptist Lake' (1894).

Davidson, John Wynn, American soldier: b. Fairfax County, Va., 18 Aug. 1824; d. St. Paul, Minn., 26 June 1881. He was a graduate from West Point in 1845; served during the Mexican war in the Army of the West, was then placed on frontier and garrison duty, and fought a battle against the Apache and Utah Indians at Cienguilla, N. Mex., in 1854, in which he lost three fourths of his command. He served in the Federal army during the entire Civil War, and in 1866 became lieutenant-colonel in the United States cavalry. He was professor of military science at the Kansas Agricultural College, and commanded various posts in Idaho, Texas, etc.

Davidson, Lucretia Maria, American poet: b. Plattsburg, N. Y., 27 Sept. 1808; d. there 27 Aug. 1825. She was remarkably precocious, and at the age of nine years wrote her first poem, 'Epitaph on a Robin.' In 1829 S. F. B. Morse collected and published her writings under the title 'Amir Khan and Other Poems.'

Davidson, Margaret Miller, American poet: b. Plattsburg, N. Y., 26 March 1823; d. Saratoga, N. Y., 1838. She was sister of L. M. Davidson (q.v.), and began to write at the age of six years. Her poems were published after her decease, with a memoir written by Washington Irving.

Davidson, Randolph Thomas, archbishop of Canterbury: b. Edinburgh, 7 April 1848. He was graduated at Trinity College, Oxford, and after holding important charges was made Bishop of Rochester in 1891; Bishop of Winchester, 1896; and succeeded the Most Rev. Frederick Temple as chief Primate of England in January 1903. He visited America in 1904. Has published 'Life of Archbishop Tait' (1891).

Davidson, Samuel, Irish biblical scholar: b. near Ballymena, Ireland, 1807; d. 1 April 1898. After entering the ministry of the Presbyterian Church, he became in 1835 professor of biblical criticism and literature in the Presbyterian Theological College in Belfast. He afterward joined the Congregationalists, and was appointed, in 1842, a professor in their college in Manchester, but had later to resign owing to his advanced opinions. His works include: 'Sacred Hermeneutics' (1843); 'Gieseler's Ecclesiastical History' (1846); 'The Ecclesiastical Polity of the New Testament' (1848); 'An Introduction to the New Testament' (1848–51); 'Biblical Criticism' (1852); 'Introduction to the Old Testament' (1862); 'Translation of Fürst's Hebrew Lexicon'; 'On a Fresh Revision of the English Old Testament' (1873); 'The New Testament Translated from the Critical Text of Von Tischendorf' (1875); 'Canon of the Bible' (1877); 'Doctrine of Last Things Contained in the New Testament' (1883).

Davidson, Thomas, Scottish philosopher and writer: b. Aberdeenshire 25 Oct. 1840; d. Montreal 14 Sept. 1900. He came to the United States in 1867, and was subsequently professor of classics in the St. Louis High School. In 1875 he settled in Cambridge, Mass. Later he traveled in Greece and Italy. Included in his publications are: 'A Short Account of the Niobe Group' (1874); 'The Place of Art in Education' (1886); 'Giordano Bruno, and the Relation of His Philosophy to Free Thought' (1886); a 'Hand-Book to Dante, from the Italian of Scartazzini' (1887); 'Prolegomena to Tennyson's "In Memoriam"'; 'Aristotle and Ancient and Modern Educational Ideals'; 'The Education of the Greek People and Its Influence on Civilization.'

Davidson, William, American general: b. Lancaster County, Pa., 1746; d. Cowan's Ford, N. C., 1 Feb. 1781. He took up arms at the outbreak of the Revolution, was major of one of the first regiments raised in Carolina, was appointed brigadier after the battle of Camden, and in 1781 was despatched by Greene to prevent Cornwallis from passing the Catawba at Cowan's Ford. With his death in the battle which ensued, and with the dispersion of his troops, began the pursuit of Greene by Cornwallis.

Davidson, William Leslie, Scottish logician: b. Meikle Wartle, Aberdeenshire, 25 May 1848. He was educated at Aberdeen University, where he has been professor of logic and metaphysics from 1895. He is the author of 'The Logic of Definition' (1885); 'English Words Explained' (1886); 'Theism as Grounded in Human Nature' (1893); 'A Philosophical Centenary' (1896); 'Christian Ethics' (1899).

Davidson College, an educational institution at Davidson, N. C., founded in 1837, under the auspices of the Presbyterian Church. Its president and instructors are about 20 in number, students over 200, volumes in the library, 14,000; value of property, $300,000; income, about $25,000.

Davie, William Richardson, American soldier; b. England 21 June 1756; d. Camden, S. C., 8 Nov. 1820. He was brought to North Carolina when a child, and was graduated at Princeton, N. J., in 1776. He entered the American army, and obtained a captaincy in Pulaski's Legion. He rose to be colonel and commissary, served throughout the war, and was a favorite officer under Sumter and Greene. He was a member of the convention to form the United States Constitution in 1787, and advocated its acceptance in the convention of North Carolina. Through his influence the University of North Carolina was established. He was elected governor of that State in 1799.

Davies, dā'vēz, **Ben,** English tenor singer; b. 1858. He studied at the Royal Academy of Music; sang for many years with the Carl Rosa Opera Company; sang in Italian opera, and had the title role in 'Ivanhoe.' He also sings in oratorios and concerts, and has several times visited the United States.

Davies, Charles, American mathematician; b. Washington, Litchfield County, Conn., 22 Jan. 1798; d. Fishkill Landing, N. Y., 18 Sept. 1876. He was educated at the United States Military Academy and was appointed professor of mathematics there in 1828. He held the same post subsequently at Columbia College and in the University of New York. He published: 'Surveying' (1832); an edition of Legendre's 'Geometry'; and other works and text-books on arithmetic, mathematics, etc.

Davies, Emily, English educator; b. Southampton, England, 22 April 1830. She has been identified with the movement for the higher education of women for over 40 years; is life governor of University College, London; honorary secretary of Girton College, Cambridge; and governor of the grammar school, Hitchin. Besides numerous pamphlets, she has published, 'The Higher Education of Women' (1866).

Davies, Henry Eugene, American soldier; b. New York 1836; d. 1894. He was admitted to the bar of New York in 1857, and entering the United States volunteers as captain when the Civil War broke out, he became brigadier-general in 1863. Serving with Sheridan he was made major-general of volunteers 1865. He resigned in 1866, afterward practising law in New York. He published 'General Sheridan' in the 'Great Commanders Series' (1895).

Davies, John, English poet; b. Hereford about 1565; d. London 1618. He was the author of 'Microcosmos' (1603); 'The Witte's Pilgrimage'; 'The Scourge of Folly'; 'Wit's Bedlam' (1617); etc.

Davies, Sir John, English poet and lawyer; b. Tisbury, Wiltshire, 1569; d. 8 Dec. 1626. He was educated at Westminster and Oxford. Called to the bar in 1595 he became solicitor-general for Ireland in 1603, and attorney-general in 1606, being knighted the next year. He was returned to the English Parliament in 1621, and appointed lord chief justice in 1626. He wrote: 'Orchestra,' a poem on dancing; 'Hymns to Astræa,' a series of acrostics; 'Nosce Teipsum,' a poem on the immortality of the soul.

Davies, Sir Louis Henry, Canadian jurist; b. Charlottetown, Prince Edward Island, 4 May 1845. He was educated at Prince of Wales College in his native town, and was called to the bar of the Inner Temple, London, in 1866. Beginning practice in Charlottetown he rose rapidly, being solicitor-general 1869 and 1871–2, premier and attorney-general of the island 1870–9, and queen's counsel in 1880. He entered the Dominion House of Commons in 1882, remaining a member till his appointment as a judge of the supreme court of Canada. He was knighted in 1897, and was minister of marine and fisheries 1896–1901. In 1898 he was one of the joint high commission on the part of Great Britain for settlement of all differences with the United States respecting Canada, and was joint delegate to Washington with Sir Wilfrid Laurier on the Bering Sea seal question the year previous.

Davies, Samuel, D.D., American clergyman; b. New Castle County, Del., 3 Nov. 1724; d. Princeton, N. J., 4 Feb. 1761. Ordained in 1747, he was at his request appointed to officiate at different places of worship in Hanover County, Va., where, the Episcopal Church being then the established church of Virginia, dissenters were obnoxious to the civil authorities. His labors were highly successful, and led to a controversy between him and the king's attorney-general as to whether the act of toleration which had been passed in England for the relief of Protestant dissenters extended also to Virginia. The ultimate decision of the question was in the affirmative. The first presbytery in Virginia was established through his exertions in 1755; and in 1758 he was chosen to succeed Jonathan Edwards as president of the College of New Jersey. A collection of his sermons was published after his death, in three volumes, and passed through several editions in Great Britain and America.

Davies, Thomas Alfred, American military officer and writer; b. Black Lake, St. Lawrence County, N. Y., 3 Dec. 1809; d. there 19 Aug. 1899. He was graduated from West Point in 1829, and became a brevet major-general of volunteers in the Civil War. Among his published works are: 'Cosmogony, or Mysteries of Creation' (1858); 'Genesis Disclosed' (1860); 'Answer to Hugh Miller and Theoretical Geologists' (1861); and 'How to Make Money, and How to Keep It' (1866).

Davies, Thomas Frederick, American Protestant Episcopal bishop; b. Fairfield, Conn., 31 Aug. 1831; d. Detroit, Mich., 9 Nov. 1905. He was a graduate of Yale in 1853, and subsequently studied at the Berkely Divinity School, where he was for a time professor of Hebrew. He was ordained in 1857, and after being successively rector of St. John's Church, Portsmouth, N. H., and St. Peter's, Philadelphia, was consecrated bishop of Michigan in 1889.

Daviess, dā'vĭs, **Joseph Hamilton,** American lawyer; b. Belford County, Va., 4 March 1774; d. Tippecanoe, Ind., 7 Nov. 1811. He was famed for his eccentricities and was commonly known as "Jo" Daviess. He was ap-

pointed United States district attorney in Kentucky and in that capacity prosecuted Aaron Burr for treason. Jo Daviess County in Illinois was named in his honor. He was killed at the battle of Tippecanoe.

Dávila, dä'vē-lä, the name of several persons well known in the history of Spanish-America: 1. Gil Gonzales. (See Central America.) 2. Juan, Spanish soldier: b. Granada, Nicaragua, 1530; served in Peru, and later under Coronado in Costa Rica, and wrote (1566) 'Relación de la Provincia de Costa Rica,' a document of historical value. 3. Coello y Pacheco, governor and captain-general of Chile, 1667–70.

Davila, Alonzo, Spanish soldier: b. city of Mexico; d. there 1566. He was supposed to be implicated in a plot to make Martin Cortes ruler of New Spain, and was executed on this account.

Davila, Enrico Caterino, ĕn-rē'ko kä-tĕr-ē'nō, Italian statesman and historian: b. near Padua, Italy, 30 Oct. 1576; d. near Verona 8 Aug. 1631. His father, a Cypriote, who fled to Venice after the conquest of Cyprus by the Turks in 1561, introduced him to the French court, where he was made page; after this he entered the French service, in which he highly distinguished himself. He subsequently entered the Venetian service, gradually rose to the post of governor of Dalmatia, Friuli, and the island of Candia, and was esteemed at Venice the first man in the republic after the doge. He is principally celebrated for his 'History of the Civil Wars of France, from 1559 to 1598' (Storia della Guerre Civili di Francia, Venice, 1630). This has been translated into several languages, and deserves a place near the works of Guicciardini and Machiavelli.

Dávila, Pedrarias, Spanish governor of the Darien colony, Castilla del Oro, and Nicaragua: b. about 1440; d. Leon, Nicaragua, July 1530. His name was originally Pedro Arias, but the form given above is better known in history. He was the brother of the Conde de Puñonrostro, and married the daughter of the Condesa de Moya, the friend of Isabel the Catholic: won distinction in the wars of Granada, and enjoyed the protection of Fonseca, bishop of Burgos, master of the affairs of the Spanish-American colonies during the reigns of Ferdinand and Isabel and Charles I. Fonseca made Dávila governor of Darien in 1514, and the governor promptly employed the adventurers who accompanied him in a number of expeditions, including that of Hernan Ponce and Bartolomé Hurtado (1516) to the coasts of the present republics of Nicaragua and Costa Rica. He established himself at Panama, and had at his command the famous soldiers Balboa, Hernandez de Córdoba, De Soto, Ojeda, Olid, Ponce, and Francisco Pizarro. In 1526–7 he asserted that, as governor of Castilla del Oro, he ought to administer Nicaragua and Honduras as well. His claim to the former was recognized. Balboa suffered death in consequence of incurring his enmity. Pedrarias is cited most frequently as the type of the vigorous, but wholly unscrupulous official of the first period of Spanish colonization on the American mainland.

Dávila y Padilla, ē pä thēl yä, **Augustin,** Mexican historian: b. Mexico 1562; d. Santo Domingo 1604. He entered the order of Dominicans in 1578, taught philosophy and theology at the College of La Puebla and Mexico, becoming prior of his convent La Puebla, and procurer of his order at the courts of Madrid and Rome 1596. He became preacher for Philippe II. 1598, and was consecrated as archbishop of Santo Domingo 1601. He burned several hundred copies of the Bible translated into Spanish and annotated by Protestants. He wrote 'Historia de la provincia de Santiago de Mejico' (1596–1634); and 'Ancient History of the Mexicans.'

Da Vinci, Leonardo. See Vinci, Leonardo Da.

Davis, Andrew Jackson, American spiritualist and author: b. Orange County, N. Y., 11 Aug. 1826. He is a resident of Boston, Mass., and the author of more than 30 volumes, chief among which are: 'The Great Harmonia'; 'Harmonial Man'; 'Philosophy of Spiritual Discourse'; 'The Penetralia.'

Davis, Charles Belmont, American author: b. Philadelphia, Pa., 24 Jan. 1866. He is a son of Rebecca Harding Davis (q.v.), was educated at Lehigh University, and was United States consul at Florence, Italy, for some time. He has written 'The Borderland of Society.'

Davis, Charles Henry, American mathematician: b. Boston 16 Jan. 1807; d. Washington, D. C., 18 Feb. 1877. He entered the United States navy in 1823, served in the Civil War, and became rear admiral in 1863. He made several coast surveys, and wrote: 'Memoir upon the Geological Action of the Tidal and Other Currents of the Ocean'; and 'The Law of Deposit of the Flood Tide.' He was one of the founders of the 'American Nautical Almanac.'

Davis, Charles Henry Stanley, American physician and Egyptologist: b. Goshen, Conn., 2 March 1840. He studied medicine in New York and in European hospitals and subsequently settled in Meriden, Conn., of which he was mayor 1887–8 and city treasurer 1897–9. He has published 'History of Wallingford and Meriden'; 'The Voice as a Musical Instrument'; 'Classification, Education and Training of Feeble Minded, Imbecile and Idiotic Children'; 'The Egyptian Book of the Dead' (edited); 'History of Egypt in the Light of Modern Discoveries'; 'Grammar of the Old Persian Language.' He has been editor of 'Biblia,' a journal of Oriental archæology, for 14 years and is a member of many learned societies.

Davis, Cushman Kellogg, American legislator: b. Henderson, N. Y., 16 June 1838; d. St. Paul, Minn., 27 Nov. 1900. He was graduated at the University of Michigan in 1857; was admitted to the bar, but enlisted in the Union army in 1861. He began the practice of law in St. Paul in 1865; was chosen to the Minnesota legislature in 1867; became United States district attorney in 1868; governor in 1874; and United States senator in 1887, 1893 and 1899. He was a Republican, and a member of the peace commission which negotiated the treaty between Spain and the United States in 1898. He was for several years chairman of the Senate Committee on Foreign Relations, and reported the resolution which practically declared war against Spain.

Davis, David, American jurist; b. Cecil County, Md., 9 March 1815; d. Bloomington, Ill., 26 June 1886. He was graduated at Kenyon College in 1832, and settled in Illinois as a lawyer in 1835. He was elected to the legislature in 1844 and served as a State circuit judge from 1848 to 1862. In the latter year he was appointed an associate justice of the Supreme Court of the United States. He voted in favor of the Legal Tender Act. He resigned in 1877 to enter the United States Senate, of which he became president pro tem. in 1881, and retired in 1883.

Davis, Edwin Hamilton, American archæologist; b. Ross County, Ohio, 22 Jan. 1811; d. New York 15 May 1888. He was the author of 'Ancient Monuments of the Mississippi Valley' (1848), which was described by A. Morlot, the distinguished Swiss archæologist, as being "as glorious a monument of American science as Bunker Hill is of American bravery."

Davis, George Royal, American financier; b. Palmer, Mass., 3 June 1840; d. Chicago 25 Nov. 1899. He enlisted for the Civil War, rising to the rank of colonel, and resigning from the army in 1871. From 1879 to 1885 he was a Republican member of Congress, and served for years on the Republican National Committee. He was director-general of the World's Columbian Exposition, Chicago, in 1893.

Davis, Henry Gassaway, American capitalist and legislator; b. Baltimore, Md., 10 Nov. 1823. He became superintendent of the plantation of ex-Gov. George Howard of Maryland, near Woodstock, Md., and subsequently was brakeman and conductor on the Baltimore & Ohio railway, and agent at Piedmont, W. Va. Then he was active as a merchant and collier at Piedmont, and later carried to success the West Virginia Central & Pittsburg Railway, by means of which he gave access to timber and coal lands of great value. The president of this road, he also became president of the Piedmont & Cumberland line. He was elected as a Democrat to the West Virginia House of Delegates in 1865, was State senator in 1867–9, and having served two terms (1871–83) as United States senator, declined re-election. In July 1904 he was nominated by the Democratic party for the vice-presidency of the United States. He was a delegate to the Pan-American congress, and became also a member of the Intercontinental Railway Commission.

Davis, Henry Winter, American statesman and orator; b. Annapolis, Md., 16 Aug. 1817; d. Baltimore, Md., 30 Dec. 1865. He was a member of Congress for three terms (1856–65), and took a leading part in advocating emancipation and loyalty to the Union. His published works are: 'The War of Ormuzd and Ahriman in the 19th century' (1853); 'Speeches and Addresses in Congress' (1867).

Davis, Jefferson, American statesman; b. Abbeville, Christian County, Ky., 3 June 1808; d. New Orleans, La., 6 Dec. 1889. When he was three years old, his father removed with his family to Wilkinson County, Miss. He received an academical education and entered Transylvania University, Lexington, Ky., in 1822, which he left in 1824 to enter the United States Military Academy, from which he was graduated in 1828. He was appointed a second lieutenant of infantry, and served on the northwestern frontier during the Black Hawk war of 1831–2. In 1831 he was promoted to first lieutenant of dragoons for gallantry in action, and was employed in operations against the Pawnees, Comanches, and other Indian tribes. In June 1835, he resigned his commission, and retired to a cotton plantation in Mississippi. He continued in retirement until 1843, when he began to take an interest in politics upon the Democratic side; and in 1844 was chosen a presidential elector. In 1845 he was elected a representative to Congress; but resigned in 1846, having been elected colonel of the First Mississippi Volunteer Regiment of rifles, and served in the Mexican war, greatly distinguishing himself at Monterey and Buena Vista, and being severely wounded in the latter battle. He was appointed a brigadier-general of volunteers by President Polk in 1847, but declined the commission on the grounds that, by the Constitution, the militia appointments were reserved to the States, and that such appointments by the President were in violation of State rights.

The same year he was chosen to fill a vacancy in the United States Senate, and was re-elected by acclamation in 1850 for a full term. In 1853 he was appointed secretary of war by President Pierce, and in 1857, was again elected to the United States Senate, when he took a prominent place among the Southern leaders, and was among the most determined of them all in his assertions of the rights of the States under the Constitution, and also of the right of secession. On 21 Jan. 1861, he took his leave of the Senate in a speech in which he gave his opinion that, by the secession of his State, his connection with that body was terminated, and reaffirmed the doctrine of the right of secession. The Confederate Congress, at Montgomery, Ala., chose him President, under the Provisional Constitution, on 9 Feb. 1861, and he accepted the office on the 16th in a brief address, in which he expressed his desire for the maintenance of peaceful relations with the States which remained in the Union. He asserted that all that the seceding States desired was to be "let alone," but announced that, if war should be forced upon them, they would make the enemies of the South "smell southern powder and feel southern steel."

When Fort Sumter was reduced by the Confederates, and war declared, he found it necessary to put all his previous experience into the immense task of organizing the military resources of the seceding States. He may be said to have created the army, the navy, the arsenals, and all the organization necessary to carry on a war which lasted four years. He bore himself through the varying struggle with untiring energy, and when, in 1865, a feeling of despair spread over the Southern States, he was the last to admit that they had been defeated.

On 17 April, two days after the first proclamation of President Lincoln, he responded by a proclamation authorizing privateering; and on 14 August issued a second one, warning all persons of 14 years and upward, owing allegiance to the United States, to leave the Confederacy within 40 days, or be treated as alien enemies. On 6 November he was chosen permanent President, and was inaugurated 22 Feb. 1862. On 21 May he approved an act in answer to one enacted by the United States



JEFFERSON DAVIS.

government, providing that all persons owing debts to parties in the North should pay the same into the Confederate treasury. Mr. Davis continued to be President of the southern Confederacy until his capture at Irwinsville, Ga., 10 May 1865, having left Richmond a few hours before Gen. Lee withdrew his troops, and after Gen. Lee's surrender, when he was endeavoring to reach the army of the West. He was conveyed to Fort Monroe, and indicted by the grand jury of the District of Columbia for treason. He was never brought to trial; never asked pardon, and only asked a trial; but, after two years' imprisonment, was released, at the instance of the government, on bail, Horace Greeley becoming one of his sureties. He was included in the General Amnesty Act of Congress, 25 Dec. 1868. In 1871 he had a public reception at Atlanta, Ga., and made a speech in which he reaffirmed his adhesion to the doctrine of State sovereignty. For several years after the war he was president of a southern insurance company and resided in Memphis, Tenn. The last years of his life were spent at Beauvoir, Miss., on an estate that he bought of Mrs. Dorsey before her death. In 1893 amid imposing ceremonies his remains were removed to Richmond, Va., and re-interred in Hollywood cemetery. A number of works have been published on the official life of Mr. Davis, and he himself gives a narrative of the stirring events of 1861–5 in 'The Rise and Fall of the Confederate Government' (1881). A more personal view of the Confederate leader is depicted in 'Jefferson Davis, a Memoir by His Wife' (1890). MRS. JEFFERSON DAVIS.

Davis, Jefferson Columbus, American military officer: b. Clark County, Ind., 2 March 1828; d. Chicago, 30 Nov. 1879. He left school for the Mexican war, in which he received a commission for gallantry. He was with the garrison at Fort Sumter, S. C., as first lieutenant when its bombardment began the Civil War. He received the brevet of major-general of volunteers, and the full rank of colonel in the regular army for distinguished service on the Union side during the war. For some years after the war he was stationed on the Pacific coast, and was the first United States army officer to hold command in Alaska, a new post, Port Davis, being named after him in 1900.

Davis, Jessie Bartlett, American contralto singer: b. Morris, near Chicago, 1860; d. Chicago 14 May 1905. She began her musical career as a church-choir singer; became noted as "Little Buttercup" in 'Pinafore,' presented by the Chicago Church Choir Opera Company 1879, and in 1882 filled the role of Siebel to Adelina Patti's "Marguerite," in 'Faust.' She was a pupil of Albiles and later studied a year in Paris with Madame La Grange. She was married to W. J. Davis in 1880, and in 1886 joined the American Opera Company as leading contralto, her husband managing the company. For many years she took leading contralto parts with 'The Bostonians,' achieving great success in "Alan-a-Dale" in 'Robin Hood.'

Davis, John, English navigator: b. Sandridge, near Dartmouth, Devonshire, about 1550; d. 30 Dec. 1605. In 1585 he was sent out with two vessels to find a northwest passage, when he discovered the strait which still bears his name. He afterward explored the coasts of Greenland and Iceland, proceeding as far as lat. 73° N. He made five voyages to the East Indies, on the last of which he was killed in an engagement with some Japanese pirates off the coast of Malacca. He wrote an account of his voyages, and invented a quadrant.

Davis, John Chandler Bancroft, American lawyer and diplomatist: b. Worcester, Mass., 29 Dec. 1822. In 1849 he went to London as secretary of the United States legation; in 1854 became American correspondent of the London *Times,* and in 1869, 1871, and 1873–4 was assistant secretary of state. He represented the United States in the "Alabama" contest, zealously pushing the "indirect" claims; was minister to Germany in 1874–7; and judge of the United States court of claims in 1878–82; and became reporter of the United States Supreme Court in 1883. He is the author of: 'The Massachusetts Justice' (1847); 'Mr. Sumner, the Alabama Claims, and their Settlement' (1878); a work published in French entitled 'Process Tribunals of the United States' (1878); and many volumes of United States Supreme Court reports.

Davis, Mary Evelyn Moore, American novelist: b. Talladega, Ala., 1852; married Thomas E. Davis in 1874. She has published: 'Minding the Gap and Other Poems'; 'In War Times at La Rose Blanche'; 'Under the Man-Fig' (1895); 'An Elephant's Track and Other Stories'; 'Under Six Flags'; 'The Wire Cutters' (1899); 'The Queen's Garden' (1900); 'Jaconetta.'

Davis, Matthew L., American writer: b. 1766; d. Manhattanville, N. Y., 21 June 1850. He was originally a printer by trade, and acquired in the course of that business a desultory education and considerable skill as a writer. He early attached himself in politics to the fortunes of Aaron Burr, and was an advocate of his elevation to the presidency. For many years he was the correspondent at Washington of the New York *Courier and Enquirer,* under the signature of "The Spy in Washington." For the London *Times* also he wrote under the name of the "Genevese Traveller." During many years before the death of Aaron Burr Mr. Davis was apparently his only attached friend, and the most important of his writings is his 'Memoirs of the Life of Aaron Burr.' Burr's diary was also edited by him.

Davis, Minnie S., American author and lecturer: b. Baltimore, Md., 1835. She was educated at the Green Mountain Liberal Institute, Vermont. After being an invalid for 25 years with spinal disease, she was healed in 1885 by "Mental Science," as she believes, and has since written and lectured upon that topic. Her published books are: 'Marion Lester' (1850); 'Clinton Forest' (1858).

Davis, Nathan Smith, American physician: b. Greene, N. Y., 9 Jan. 1817; d. Chicago, Ill., 16 June 1904. He studied medicine and since 1849 has practised his profession in Chicago. He was one of the founders of the Chicago Medical College, now a department of Northwestern University and was a professor there for 30 years, resigning in 1898. He has edited several medical journals and pub-

'Principles and Practice of Medi- ... Education and Reform'; 'Report ... Concerning the Effects of ... Man.'

Davis, Noah, American lawyer: b. Haver- ... N. H., 11 Sept. 1818; d. New York city, 20 Mar. 1... He was admitted to the New York ... bar in 1841 and practised for some time ... Pa. He was justice of the New York ... court 1857–68, and again 1872–87. The ... of Edward Stokes for the murder ... James Fisk, Jr., and of William M. Tweed ... embezzlement, were tried before him.

Davis, Noah Knowles, American philosophical writer: b. Philadelphia, Pa., 15 May 1830. He was educated at Mercer University, Ga., and after holding various educational positions, has been professor of philosophy at the University of Virginia from 1873. He has published: 'The Theory of Thought' (1880); 'Elements of Deductive Logic' (1890); 'Elements of Psychology' (1892); 'Judah's Jewels: a study in the Hebrew Lyrics' (1895); 'Elements of Ethics' (1900); 'Synopsis of Events in Life of Jesus of Nazareth' (1900); 'The Nazarene' (1901).

Davis, Oscar King, American journalist: b. Baldwinsville, N. Y., 13 Jan. 1866. He was graduated from Colgate University in 1888 and was a special correspondent for the New York *Sun* and 'Harper's Weekly' at Manila 1898–9, and in China in 1900. He has published: 'Our Conquests in the Pacific.'

Davis, Rebecca Blaine Harding, American novelist: b. Washington, Pa., 24 June 1831. She was married to L. C. Davis in 1863. She contributed many short stories and sketches to periodicals, and has written several novels, including: 'Life in the Iron Mills' (1861); 'A Story of To-day' (1891), published later under the title 'Margaret Howth'; and 'A Law Unto Herself' (1878). She was the first writer in this country to introduce the labor question into fiction. Her later works include: 'Waiting for the Verdict'; 'Dallas Galbraith'; 'Natasqua'; 'Frances Waldeaux'; 'Doctor Warrick's Daughters'; 'Silhouettes of American Life.'

Davis, Richard Harding, American novelist and littérateur: b. Philadelphia 18 April 1864. He is a son of Rebecca Harding Davis (q.v.). He was graduated at Lehigh University, and entered journalism in Philadelphia. His first purely literary success was the story of 'Gallegher,' based upon his newspaper experiences, and published with other stories in a volume (1891). He has since been constantly engaged in story-writing, and descriptive narration of events, places, and people. Among his works are 'Stories for Boys' (1891); 'The West from a Car Window' (1892); 'Van Bibber and Others' (1892); 'Our English Cousins' (1894); 'The Rulers of the Mediterranean' (1894); 'The Princess Aline' (1895); 'About Paris' (1895); 'Three Gringoes in Venezuela and Central America' (1896); 'Soldiers of Fortune' (1897) 'Cuba in War Time' (1898); 'A Year From a Reporter's Note Book' (1898); 'Cinderella, and Other Stories'; 'Exiles'; 'The Lion and the Unicorn' (1899); 'Episodes from a Car Window' (1899); 'With Both Armies in South Africa' (1900); 'Miss Civilization' (1905). He was a war correspondent in Cuba (1898) and in South Africa (1900).

Davis, Thomas Osborne, Irish poet: b. Mallow, County Cork, 14 Oct. 1814; d. Dublin, 16 Sept. 1845. His verse was mainly on patriotic themes, and appears, collected, in Duffy's 'Library of Ireland.'

Davis, Val, English artist: b. Liverpool, England, 1854. He studied art under his father, William Davis, a painter of some note, and under Ford Madox Brown, and has exhibited at the Royal Academy almost continuously from 1875.

Davis, Varina Anne Jefferson, American novelist: b. Richmond, Va. 27 June 1864; d. Narragansett Pier, R. I., 18 Sept. 1898. She was called "the Daughter of the Confederacy," her father being Jefferson Davis, the President of the Confederate States. Her education was obtained partly in the United States and partly in Germany and France, and she wrote 'The Veiled Doctor,' a novel, and 'A Romance of Summer Seas.'

Davis, Varina Howell Jefferson, American writer: b. Vicksburg, Miss., 7 May 1826. She was the second wife of Jefferson Davis (q.v.), to whom she was married in Natchez, 26 Feb. 1845. She was her husband's amanuensis when he wrote his 'Decline and Fall of the Confederate Government' and is the author of 'Jefferson Davis: a Memoir, by His Wife' (1890).

Davis, William Morris, American geologist and meteorologist: b. Philadelphia, Pa., 12 Feb. 1850. He has been professor of geology at Harvard University from 1890 and has published 'Elementary Meteorology'; 'Physical Geography'; 'Whirlwinds, Cyclones and Tornadoes' (1884), and many professional papers.

Davis, William Thomas, American lawyer and author: b. Plymouth, Mass., 3 March 1822. He was educated at Harvard and was admitted to the bar in 1849. He was at the head of the government of his native town for many years, and has published 'History of Plymouth'; 'Ancient Landmarks of Plymouth'; 'History of the Bench and Bar of Massachusetts'; etc.

Davis, William Watts Hart, American writer: b. Southampton, Bucks County, Pa., 27 July 1820. He was graduated at Norwich University in 1842; was instructor in the military academy at Portsmouth, Va., in 1842, and was admitted to the bar in 1845. He served in the Mexican war and was mustered out as captain in 1848. Removing to New Mexico he was United States district attorney, attorney-general, secretary of the treasury, acting governor, superintendent of Indian affairs and superintendent of public buildings, beside publishing the Santa Fe *Gazette* for two or three years. He attained the rank of brevet brigadier-general in the civil war between the States, was twice defeated as Democratic nominee for Congress, and was United States commissioner to the Paris Exposition in 1878. He has published 'El Gringo: or New Mexico and Her People'; 'Spanish Conquest of New Mexico'; 'History of Bucks County'; etc.

Davis Strait, a strait on the west coast of Greenland, which connects Baffin Bay with the Atlantic Ocean. At its narrowest point, immediately north of the Arctic circle, it measures about 200 miles across. In 1888 the identity between Ginnunga Gap, referred to in the Sagas, and the present Davis Strait, was demonstrated. See DAVIS, JOHN.

Davit. (1) A beam projecting from a ship's bow, for the attachment of the tackle whereby the anchor-fluke is lifted without dragging against the side of the vessel. The operation is nautically called "fishing the anchor." (2) One of a pair of cranes on the gunwale of a ship, from which are suspended the quarter or other boats. The boat-tackles are attached to rings in the bow and stern of the boat respectively, and the fall is belayed on deck. When the boat is lowered the hooks of the fall-blocks are cast off simultaneously, or great danger results when the ship is under way.

Dav'itt, Michael, Irish political leader: b. near Straid, County Mayo, 25 March 1846. Evicted from their small holding, the family emigrated to Haslingden in Lancashire (1851). In 1866 he joined the Fenian movement, the result being that he was sentenced in 1870 to 15 years' penal servitude. He was released in 1877; and, supplied with funds from the United States, began some two years later an anti-landlord crusade in Ireland, which culminated in the foundation of the Irish Land League (21 Oct. 1879). Davitt was thenceforward in frequent collision with the government, and from February 1881, to May, 1882, was imprisoned in Portland for breaking his ticket-of-leave. His 'Leaves from a Prison Diary' were published in 1885. Other works by him are: 'Defence of the Land League' (1891); 'Life and Progress in Australia' (1898); 'The Boer Fight for Freedom' (1902). The views of the "Father of the Land League" on the subject of land therein take a Socialistic form, and accordingly, though a strong Home Ruler, on the question of land nationalization he found himself in opposition to the Parnellites. After the split in the party, he opposed the continued leadership of Mr. Parnell, and was returned to Parliament in 1892 as an anti-Parnellite, but unseated on petition, on the ground of clerical and other intimidation. He was returned unopposed for South Mayo in 1895, resigning in 1899.

Da'vium. See DAVYUM.

Davos, dä'vōs, a valley and district of Switzerland in the canton of Grisons, lying at a considerable elevation among the Alps, and now a favorite place of residence both in summer and winter for people troubled with tuberculosis. The valley is about 10 miles long, shut in by mountains from 6,000 to 10,000 feet high, and exhibiting many picturesque features. The chief centre of population is Davos-Platz, a place of 5,000 inhabitants, containing numerous hotels, boarding-houses, and other establishments for visitors, and having a handsome town-house, and an English church. It is well sheltered on the north and east, and the air is remarkably pure and dry.

Davout, Louis Nicolas, loo-ē nĭk-ō-lä dä-voo, marshal of France: b. Annoux 10 May 1770; d. Paris, 1 June 1823. He entered the army in 1785, took sides with the revolutionists, fought several battles under Dumouriez, and was made a brigadier-general in 1793. He accompanied Napoleon in his Italian campaigns and in his expedition to Egypt. In 1804 he was made a marshal of the empire. The victories of Ulm and Austerlitz were mainly due to him, as also those of Eckmühl and Wagram. For these meritorious services he was created Duke of Auerstadt and Prince of Eckmühl. After the retreat from Moscow he defended Hamburg against all the forces of the allies, and surrendered only after the peace of 1814. When Napoleon returned from Elba, Davout was appointed his minister of war. After the battle of Waterloo he lived in retirement till 1819, when he took his seat in the Chamber of Peers.

Davy, Sir Humphry, English chemist: b. Penzance, Cornwall, 17 Dec. 1778; d. Geneva, Switzerland, 29 May 1829. A taste for chemistry, which he displayed in some experiments on the air contained in sea-weed, attracted the attention of Mr. Gilbert, president of the Royal Society, and Dr. Beddoes, and the latter offered him the place of assistant in his laboratory. Here Davy discovered the respirability and exhilarating effect of the nitrous oxide. He published the results of his experiments, under the title of 'Chemical and Philosophical Researches' (1800). This work immediately obtained him the place of professor of chemistry in the Royal Institution, at the age of 22. In 1803 he was chosen a member of the Royal Society. His lectures at the Royal Institution were attended by crowded and brilliant audiences, attracted by the novelty and variety of his experiments, the eloquence of his discourses, and the clearness of his exposition. His discoveries with the galvanic battery, his decomposition of the earths and alkalies and ascertaining their metallic bases, his demonstration of the true nature of oxymuriatic acid, his discovery of chlorine as an element, etc., obtained him a European reputation; and in 1808 he received the Napoleon prize of the French Institute. In 1812 he was knighted. In 1813 appeared his valuable 'Elements of Agricultural Chemistry.' The numerous accidents arising from fire-damp in mines led him to enter upon a series of experiments on the nature of this explosive gas, the result of which was the invention of his safety-lamp (1815). In 1818 he received a baronetcy. In 1820 he succeeded Sir J. Banks as president of the Royal Society. Near the close of his life he wrote his 'Salmonia, or Days of Fly-fishing'; and his 'Consolations in Travel, or the Last Days of a Philosopher.' Besides the works already mentioned, he also wrote: 'Elements of Chemical Philosophy' (1802); 'Bakerian Lectures' (1807–11); 'On the Safety-lamp' (1818); etc. A statue was erected to him at Penzance in 1872.

Davy, John, English composer: b. Upton-Helion, Exeter, 1765; d. London 22 Feb. 1824. He was a teacher of music in London and wrote music for popular songs. His air, 'The Bay of Biscay, Oh!' is famous.

Davy Jones, a sailor's familiar name for a malignant sea-spirit or the devil generally. The common phrase "Davy Jones' locker" is applied to the ocean as the grave of men drowned at sea. A very dubious explanation of the name makes it compounded from Duffy, a West Indian negro spirit name, and the scriptural prophet Jonah, in jocular allusion to his somewhat unusual adventure.

Davy Lamp, the safety-lamp of Sir Humphry Davy, in which a wire-gauze envelope covers the flame-chamber and prevents the passage of flame outward to the explosive atmosphere of the mine, while it allows circulation of air.

Davyum, or **Davium** (named in honor of Sir Humphry Davy), a substance observed by Kern in June 1877 in certain Russian ores of platinum and believed by him to be a metallic element. It is hard, infusible, malleable at a red heat, silvery in lustre, and soluble readily in aqua regia and feebly in boiling sulphuric acid. Mallet (Am. Chem. Jour., Vol. XX., p. 779) has shown that davyum is not an element, but that it consists of a mixture of zircon, osmium, iridium, and finely divided quartz.

Daw. See JACKDAW.

Dawalla (*Hyperphthalmus dawalla*), a fish of the family *Siluridæ*, found in the rivers of Guiana, and highly esteemed for the delicacy of its flesh. It is sometimes two and a half feet long, and is brightly colored. The eye is situated below the angle of the mouth.

Dawant, Albert Pierre, al-bār pē-ār dä-van, French historical painter: b. Paris 21 Sept. 1852. He was a pupil of J. P. Laurens. He took a medal of the third class 1880, and second class 1885. Among his works are: 'St. Thomas à Becket' (1879); 'Henry IV. of Germany Before Pope Gregory VII.' (1880); 'Last Moments of Charles II. of Spain' (1881); 'Burial of an Invalide' (1882); 'Salute to the Invalides' (1884); 'St. John the Hospitaller' (1885); 'Embarking of Emigrants'; and 'The Rescue' (1889); 'In Alsace' (1892); 'Teaching the Children' (1888), in the Luxembourg Museum; 'End of the Mass' (1890); 'A Rehearsal' (1894); 'Marshall Lannes at Convent of St. Pollen' (1895); 'The Captive' (1896).

Dawe, Carlton, English novelist. He has written: 'Mount Desolation'; 'The Emu's Head'; 'Yellow and White'; 'Kakemonos'; 'Captain Castle'; 'The Voyage of the Pulo Way'; 'A Bride of Japan'; 'The Mandarin'; 'Rose and Chrysanthemum'; 'The Yellow Man'; 'Claudia Pole'; 'Straws in the Wind'; 'The Demagogue.'

Dawes, Anne Laurens, American writer: b. North Adams, Mass., 14 May 1851. She is the daughter of H. L. Dawes (q.v.) and has been Washington correspondent of several New England papers, besides being prominent in various philanthropic and other organizations. She is the author of 'How We are Governed' (1885); 'The Modern Jew: His Present and Future' (1886); 'Explanation of the Constitution and Government of the United States' (1895); 'Charles Sumner' (1892).

Dawes, Charles Gates, American financier: b. Marietta, Ohio, 27 Aug. 1865. He was educated at Marietta College and the Cincinnati Law School, was for some time engaged in civil engineering, and practised law in Lincoln, Neb., 1887–94. He was active in Republican politics, and in 1897 became comptroller of the treasury. He is the author of 'The Banking Systems of the United States.'

Dawes, Henry Laurens, American legislator: b. Cummington, Mass., 30 Oct. 1816; d. Pittsfield, Mass., 5 Feb. 1903. He was graduated at Yale in 1839. Becoming a lawyer, he entered the State Senate as a Republican and in 1857 was elected to Congress, serving in the House until 1873. He was elected to the United States Senate in 1875, and was re-elected in 1881 and 1887. The condition of the Indian tribes especially claimed his attention, and after his retirement from Congress he was at the head of the Commission to the Five Civilized Tribes.

Dawes, Rufus, American poet: b. Boston 20 Jan. 1803; d. Washington, D. C., 30 Nov. 1859. He wrote 'The Valley of the Nashaway, and Other Poems' (1830); 'Geraldine' (1839), resembling 'Don Juan' in form and treatment; the successful romance 'Nix's Mate' (1840). His verses were sung at the laying of the corner-stone of Bunker Hill monument.

Dawes, William Rutter, English astronomer: b. London 19 March 1799; d. Haddenham, Buckinghamshire 15 Feb. 1868. He is principally celebrated for his accurate measurements of double stars and for his investigation into the minute details of the solar surface.

Dawes' Holes, minute circular spots on the nucleus of a sun-spot, darker than the rest of the nucleus, and supposed to be the mouths of tubular orifices penetrating to unknown depths. They were first observed by the astronomer whose name they bear.

Dawk, or Dak, a term in India for postal traveling arrangements, as by palanquins or other carriages.

Dawkins, John. See ARTFUL DODGER, THE.

Dawkins, William Boyd, English geologist: b. Buttington, near Welshpool, Montgomeryshire, 26 Dec. 1838. In 1862 he joined the Geological Survey, became curator of Manchester Museum in 1869, and professor of geology in Owens College there in 1874. In 1882 he presided over the anthropological section at the Southampton meeting of the British Association. The Channel Tunnel Committee employed him in 1882 to make a special survey of both coasts, and next year he laid down the line for a tunnel under the Humber. He is a Fellow of the Royal and other learned societies, and has contributed numerous papers to their issues relating especially to fossil mammalia. His chief works are: 'Cave-hunting: Researches on the Evidences of Caves Respecting the Early Inhabitants of Europe' (1874); 'Early Man in Britain, and His Place in the Tertiary Period' (1880); the latter a work of great interest; 'British Pleistocene Mammalia' (1866–87).

Dawlish, dâ'lĭsh, popular watering place in Devonshire, England, situated at the entrance of a valley which extends inland from the English Channel, between the mouths of the Teign and Exe. Its genial climate, its bathing facilities, and other attractions render it a place of great resort. Pop. (1901) 4,003.

Dawson, Alec John, English novelist and traveler: b. Wandsworth, England, 1871. He has traveled extensively in the South Seas, Africa, South America, etc., and is the author of 'Middle Greyness'; 'Mere Sentiment'; 'Leeway'; 'God's Foundling'; 'The African Nights' Entertainments'; 'Bismillah'; 'In the Bight of Benin'; 'Daniel Whyte'; 'The Story of Ronald Kestrel'; 'Joseph Klassin: Half Caste.'

Dawson, George Mercer, Canadian geologist: b. Pictou, Nova Scotia, 1 Aug. 1849; d. 1901. He was a son of Sir J. W. Dawson (q.v.) and was educated at McGill University and at the Royal School of Mines in London. In 1874 he was made assistant director

and in 1895 director of the Geological Survey of Canada. He was the author of 'Geology and Resources of the Forty-ninth Parallel,' and similar works.

Dawson, Henry, English landscape painter: b. Hull 3 April 1811; d. Chiswick 13 Dec. 1878. In early life he was a worker in a Nottingham lace-factory, but this occupation he gave up for art in 1835. After struggling some time at Nottingham he removed to Liverpool in 1844, and thence to Croydon in 1850, and subsequently he resided at Chiswick. It was long before his abilities were fully recognized, and his pictures began to bring high prices only a little before his death. Among the best of them are 'Wooden Walls of Old England'; 'London from Greenwich Hill'; 'Houses of Parliament'; 'The Rainbow'; 'Rainbow at Sea'; 'The Pool Below London Bridge.'

Dawson, Sir John William, Canadian geologist: b. Pictou, Nova Scotia, 13 Oct. 1820; d. Montreal 19 Nov. 1899. He was educated at Edinburgh University, and early turned his attention to geology. He accompanied Sir Charles Lyell when examining the geology of Nova Scotia in 1842. In 1850 he became superintendent of education for Nova Scotia, and in 1855 principal and professor of natural history in McGill College, Montreal, in which position, as well as in that of vice-chancellor, and latterly principal of the university (1855–93), his services in the cause of education were of very great importance. He became a member of the Royal Society (London) in 1862, was knighted in 1885, and was president of the British Association in 1886 during its meeting at Birmingham. His published works include: 'Acadian Geology' (1855); 'Archaia, or Studies of the Narrative of Creation in Genesis' (1857); 'Agriculture for Schools' (1864); 'Handbook of Canadian Zoology' (1871); 'The Story of Earth and Man' (1872); 'The Origin of the World' (1878); 'The Chain of Life in Geological Time' (1881); 'The Geological History of Plants' (1888); 'Modern Science in Bible Lands' (1888); 'Handbook of Canadian Geology' (1889); 'Modern Ideas of Evolution' (1890); 'The Ice Age in Canada' (1894).

Dawson, Miles Menander, American actuary and author: b. Viroqua, Wis., 13 May 1863. He has published: 'Elements of Life Insurance' (1892); 'American Life Insurance Methods' (1893); 'Assessment Life Insurance' (1895); 'Lessons in Actuarial Science' (1897); 'American Experience' (1900); 'Things Agents Should Know' (1900); etc.

Dawson, William James, English poet, novelist, and clergyman: b. Towcester, Northamptonshire, 21 Nov. 1854. He entered the Wesleyan ministry in 1875 and held various Wesleyan pastorates until 1892, when he became pastor of the Highbury Quadrant Congregational Church, London. His works include: 'Arvalon: a First Poem' (1878); 'A Vision of Souls' (1884); 'Quest and Visions: Essays on Life and Literation' (1886); 'The Threshold of Manhood' (1889); 'The Makers of Modern Poetry' (1890); 'The Redemption of Edward Strahan: a Social Story' (1891); 'Poems and Lyrics' (1893); 'London Idylls' (1895); 'The Comrade-Christ: Sermons' (1894); 'The Story of Hannah' (1896); 'The House of Dreams' (1897); 'Through Lattice Windows' (1897); 'Table Talk With Young Men' (1898); 'Judith Boldero, a Tragic Romance' (1898); 'Makers of Modern Prose' (1899); 'Savonarola: a Drama' (1900); 'The Man Christ Jesus' (1901).

Dawson, Canada, city and capital of Yukon District, Northwest Territories. It is situated on the right bank of the Yukon River, 1500 m. from its mouth, at the confluence of the Klondike River, about 50 m. east of the Alaskan boundary; in lat. about 64° N. and lon. 139° W. The city, which is near the site of old Fort Reliance, has grown up since the discovery of gold on Bonanza Creek, 16 Aug. 1896, and is the receiving and distributing center for the Klondike mining district. It is mostly well built, the two great fires of 1899 having destroyed many of the rude, temporary structures. It has churches, schools, banks, warehouses, hotels, newspapers, telegraph and telephone service, theatres, and an electric light plant. Forty below zero is the average temperature for days at a time, but blizzards are not common. Thawing the ground by steam, the use of automatic lifts and buckets, and of machinery in general, have largely increased the gold output of the region. Coal deposits have been found nearby. Steamers ply upon both the upper and lower Yukon. Dawson has a United States consulate. Pop. (1901) 9,142.

Dax, däks, a town of France, department of Landes, on the left bank of the Adour. It consists of the town proper, surrounded by old ramparts partly Roman, and of a suburb called Sablar, on the opposite side of the river and communicating with it by a bridge. The principal edifices are the high church, once a cathedral, the bishop's palace, now occupied as public offices, the communal college, normal school, assembly-room, handsome thermal establishment, etc. There are various ancient Roman remains. Its chief attraction is its warm sulphur springs, which have temperatures varying from 86° to 166° F., were much frequented by the Romans, and are still in great repute. Its old name was Aquæ Tarbellicæ, and from Aquæ ("waters") comes its modern name. Pop. (1896) 8,307.

Day, Benjamin Franklin, American naval officer: b. Ohio. He was educated at the Naval Academy 1858–61, served in various capacities during the Civil War and became a rear admiral in March 1899, retiring in March 1900.

Day, George Edward, American Hebrew scholar: b. Pittsfield, Mass., 19 March 1815; d. 2 July 1905. He was educated at Yale and the Yale Theological Seminary, and entering the Congregational ministry was successively pastor at Marlborough and Northampton, Mass., 1840–51. He was professor of biblical literature at Lane Theological Seminary, Cincinnati, 1851–66, and of Hebrew at Yale 1866–95, and professor emeritus from the last named year.

Day, Henry Noble, American educator: b. Washington, Conn., 4 Aug. 1808; d. New Haven, Conn, 12 Jan. 1890. He was a nephew of Jeremiah Day (q.v.) and became professor of sacred rhetoric in Western Reserve College in 1840, and was president of the Ohio Female College in 1854–64. He published: 'The Art of Elocution' (1841); 'The Art of Rhetoric' (1850); 'Elements of Logic' (1867); 'The Science of Æsthetics' (1872); 'The Science of Thought' (1886); 'Elements of Mental Science' (1889).

Day, Holman F., American journalist and poet: b. Vassalboro, Me., 6 Nov. 1865. He was graduated at Colby College in 1887 and entering journalism the year after, has since been editorially connected with various Maine journals. He has contributed extensively to periodicals and is the author of two volumes of popular verse: 'Up in Maine' (1900); 'Pine Tree Ballads' (1902).

Day, Horace H., American manufacturer: b. 1815; d. Manchester, N. H., 23 Aug. 1878. He early entered the rubber industry, but was compelled to retire from it as a result of patent litigations with the Goodyear interests. In 1856 he had begun to advocate the utilization of the water power of Niagara Falls, a project, however, in which he expended large sums without return. He returned to the rubber industry, but ultimately lost his fortune.

Day, James Roscoe, American Methodist clergyman: b. Whitneyville, Md., 17 Oct. 1845. He was graduated from Bowdoin College in 1874, entered the Methodist ministry and was successively pastor in Portland, Boston, and New York. He is at present (1903) chancellor of Syracuse University.

Day, Jeremiah, American educator: b. New Preston, Conn., 3 Aug. 1773; d. New Haven, Conn., 22 Aug. 1867. He was graduated at Yale 1795. Having early made choice of the profession of theology, while acting as tutor he began to preach as a candidate for the ministry; but before taking charge of any parish, was in 1801 elected to the professorship of mathematics in Yale College. In 1817 he became president of the college, continuing in that position till his resignation in 1846. He published: 'An Introduction to Algebra' (1814); 'Navigation and Surveying' (1817); and other works.

Day, John, English dramatist: fl. about 1600. Of his life hardly anything is known. He is mentioned in Henslowe's 'Diary' in 1598 as an active playwright. But few of his earlier works have come down to us save 'The Blind Beggar of Bethnal Green.' Day collaborated freely with contemporary writers, as Chettle and Dekker. Ben Jonson in his conversations with Drummond of Hawthornden grouped him with some other admirable gentlemen and authors as a rogue and a base fellow. His best works that have reached us are a graceful comedy, 'Humor out of Breath'; and 'The Parliament of Bees,' a kind of allegorical masque in which all the characters are bees. "The very air," says Charles Lamb, "seems replete with humming and buzzing melodies. Surely bees were never so bethymed before." An edition of Day's works was privately printed by A. H. Bullen in 1881.

Day, Lewis Foreman, English decorative artist: b. London 1845. He was trained in the workshops of Clayton and Bell and for 30 years has designed wall decorations, textiles, glass, and various other manufactures connected with ornament. He has lectured on art topics frequently at the South Kensington Art Museum, and is the author of 'Principles of Everyday Art'; 'Nature in Ornament'; 'Stained Glass Windows'; 'Art in Needlework'; 'Alphabets Old and New' 'Lettering in Ornament'; 'Text Books of Ornamental Design' (4 vols.).

Day, Richard Edwin, American journalist and poet: b. West Granby, Oswego County, N. Y., 27 April 1852. He was educated at Syracuse University and was on the editorial staff of the Syracuse *Standard* 18 years. He has published: 'Lines in the Sand' (1878); 'Thor: a Drama' (1880); 'Lyrics and Satires' (1883); 'Poems' (1888).

Day, or **Daye, Stephen**, American colonial printer: b. London about 1610; d. Cambridge, Mass., 22 Dec. 1668. He was employed by the Rev. Joseph Glover to accompany him to America in 1638, to operate a printing press which he was going to set up in Massachusetts. Mr. Glover died on the voyage and the press was placed in the house of Rev. Henry Dunster, first president of Harvard College. The first book printed in the colonies was issued from it in 1640, and was entitled 'The Whole Booke of Psalmes, faithfully translated into English metre,' commonly styled 'The Bay Psalm Book.' The printing house was taken from him about 1648, and put into the hands of Samuel Green. See Thomas, 'History of Printing in America' (1810).

Day, Thomas, English writer: b. London 22 June 1748; d. 28 Sept. 1789. He was educated at Oxford, and was called to the bar but never practised. In 1778 he married a Miss Esther Milnes, who was willing to conform to his ascetic requirements. His principles led him to renounce most of the indulgences of a man of fortune that he might bestow his superfluities upon those who wanted necessaries. He wrote, in prose and verse, on various subjects, but his name is kept alive chiefly by the well-known book written for the young, entitled 'History of Sandford and Merton.'

Day, William Rufus, American jurist: b. Ravenna, O., 17 April 1849. He was graduated from the University of Michigan in 1870, and from the law school of the same institution in 1872. In the latter year he was admitted to the Ohio bar, and began the practice of law at Canton, where he soon gained local and state distinction; in 1886 he was elected judge of the common pleas court of the 9th judicial district, being the candidate of both political parties. In 1889, President Harrison appointed him United States district judge for the northern district of Ohio, but he was obliged to decline the appointment on account of ill health. In 1897 he was made assistant secretary of state by his friend, President McKinley, and in April 1898 he succeeded Sherman as secretary of state, as such conducting all the negotiations of the Spanish war. Later in 1898 he resigned the secretaryship, and was appointed chairman of the United States Peace Commission to frame a treaty of peace with Spain, in which capacity he had a conspicuous and responsible part in all peace negotiations. He then returned to his law practice, but in 1899 was appointed to succeed Judge Taft as United States circuit judge, and on 20 Jan. 1903 was appointed to the Supreme Court by President Roosevelt.

Day, a word used with several different senses. Its most ancient meaning is the period of light ("natural day") as opposed to the period of darkness, and in this sense it is still quite commonly used. Its most common application, however, is to the period of light and that of darkness together, but even in this sense there are different days. The sidereal day is the time



WILLIAM R. DAY,

ASSOCIATE JUSTICE UNITED STATES SUPREME COURT.

that elapses between two successive culminations (see CULMINATION) of any particular fixed star, or, in other words, is the time occupied by a revolution of the earth round its axis. The solar, astronomical, or apparent day is the time that elapses between two successive returns of the same terrestrial meridian to the centre of the sun. This period is not always of the same length, and its mean length gives us the mean solar or civil day. The 24 hours of the sidereal day are numbered in succession from 1 to 24, while the civil day in most countries is divided into two portions of 12 hours each. The abbreviations P.M. and A.M. (the first signifying *post meridiem*, Latin for afternoon; the latter *ante meridiem*, forenoon) are requisite, in consequence of our division of the day into two periods of 12 hours each. In this respect the mode of numbering the hours from 1 to 24 consecutively has an advantage, and in some countries is being introduced; in parts of Italy it has long prevailed. The Babylonians began the day at sunrising; the Jews and Greeks at sunsetting; the Egyptians and Romans at midnight, as do most modern peoples. Astronomers use a day of the same length as the civil, but commonly make it begin at noon and number the hours up to 24, though latterly midnight has been partly adopted as the starting-point.

If we take a day according to the second definition given above (that is, a sidereal day), its length, of course, is the same throughout the year (see SIDEREAL TIME). The solar day, in consequence of the varying rapidity of the earth in its orbit, and the obliquity of the ecliptic, is different at different times (see SOLAR TIME), and this difference is uniform throughout the earth; but the time of the natural day (or period of light) is different at the different points of the earth, according to their distance from the equator. The daily apparent revolution of the sun takes place in circles parallel to the equator. If the equator and the ecliptic coincided, the circle bounding light and darkness would always divide, not merely the equator, but all its parallels, into two equal parts, and the days and nights would be equal in all the parallels through the year; but at the poles there would be no night. Owing to the inclination of the earth's axis to the plane of its orbit (the ecliptic), the parallel of latitude in which the sun appears to move is continually changing; and therefore the equator alone (being a great circle) always remains bisected by the circle dividing light from darkness; so that the days and nights here are always equal; while the parallels of latitude, not being great circles, are not equally divided by the circle separating light from darkness, except at the time of the equinox, when the sun is moving in the equator; and, of course, at this time only are the days and nights equal in those parallels. As you approach the poles the inequality between the days and nights becomes continually greater, till, at the poles themselves, a day of six months alternates with a night of equal duration. The most distant parallel circles which the sun describes north and south from the equator are, as is well known, only 23½° from it. The distance between the polar circles and the poles is the same. Therefore, as a little reflection will show, when the sun is in one of the tropics, all the polar circle in the same hemisphere will be within the illuminated region (because it will be within 90° of the sun) during the whole of a diurnal revolution, while the other polar circle will be in the region of darkness. These circles, therefore, have one day of 24 hours, and one night of the same length in each year. From the polar circles to the poles the time of the longest day increases fast, and in the same measure the length of the longest night. Notwithstanding the inequality of the periods of light and darkness in the different parts of the earth, each portion of the earth's surface has the sun above its horizon every year precisely six months, and below it the same length of time.

A day, in law, includes the whole 24 hours from midnight to midnight. In reckoning periods of time from a certain event, the day on which the event occurred is excluded. On the other hand, if it be required to prove survival for a certain number of days, it will suffice if the person be alive for any portion, however small, of the last day. While an obligation to pay on a certain day would therefore be theoretically discharged by payment before midnight, the law requires that reasonable hours be observed — for example, if the payment (as a bill) is at a bank or place of business, it must be within business hours.

A lawful day is a day on which there is no legal impediment to the execution of a writ — that is, a day may be unlawful, *dies non juridicus*, either by common law, or specific statute. By common law Sunday is a day on which the service of a writ cannot legally be made. Other days have been made holidays by both State and Federal statute in this country, and no such legal holiday is a lawful day.

Day-lily, the popular name for a genus of lilies (*Hemerocallis*), natives of temperate Asia and chiefly of eastern Europe, grown in gardens. They have long radical leaves, and a branched few-flowered scape, with handsome large blossoms, the segments of which are united into a tube. The flowers are found in meadows and along streams throughout the Atlantic seacoast from New Brunswick to Virginia, and west to Ontario and Tennessee. A species with bright yellow flowers (*H. flava*) is sometimes found near old gardens. The name of the genus is from Greek signifying "beautiful for a day." In Europe these plants are sometimes cultivated as fodder for cattle.

Day-Blindness, or **Hemeralopia**. See VISION, DEFECTS OF.

Day of Sections, in French history, 4 Oct. 1795, when the National Guard attacked the Convention in the Tuileries. The forces of the government, under command of Napoleon, disarmed the regiments in the different sections, the first clash occurring in the Rue Saint Honoré.

Dayfly, a name sometimes used for the well-known Mayfly. A neuropterous insect of the family of *Ephemeridæ*. The infant stages of larva and pupa are unusually long, often extending to 10 months; but the adult period is short, and is passed without taking food, and covers only a few hours, never more than a day. In the early summer Mayflies abound in great numbers about northern lakes and rivers, furnishing food for other insects, and for crustaceans and fish.

Days of Grace. The time at which a bill [illegible] payable, except in the case [illegible] payable on demand or at sight, is three days after the time expressed on the face of it, and these three additional days are called days of grace. The last of the third day of grace [illegible] Sunday, Christmas Day, Good Friday, [illegible] last or thanksgiving day, the bill is payable the day before. In the United States, a bill or note becoming due on a Sunday or a holiday is payable on the first business day thereafter.

Dayton, Elias, American soldier; b. Elizabethtown, N. J., July 1737; d. there 17 July 1807. He joined the British forces in 1760 which were employed in completing the conquest of Canada from the French; and he subsequently commanded a company of militia, with which he marched on an expedition against the northern Indians. He took part in the important battles of Springfield, Monmouth, Brandywine, Germantown, and Yorktown. After the war he served several terms in the legislature of his native State.

Dayton, John, American colonial governor; b. about 1721; d. Charleston, S. C., 27 Nov. 1822. He held several government offices, was chosen governor of South Carolina in 1800 and again in 1808, and was afterward appointed judge of the United States district court, a position which he held until his death. He published: 'A View of South Carolina,' and 'Memoirs of the Revolution' in that State.

Dayton, Jonathan, LL.D., American statesman; b. Elizabethtown, N. J., 16 Oct. 1760; d. there 9 Oct. 1824. In 1778 he entered the American army as a paymaster. In 1791 he was elected by the Federal party a representative in Congress, in which capacity he served for three successive terms, during the last two of which he was speaker of the House. In 1799 he was elected to the United States Senate.

Dayton, William Lewis, American jurist and statesman; b. Baskingridge, N. J., 17 Feb. 1807; d. Paris 1 Dec. 1864. He was graduated at the college of New Jersey in 1825; and was admitted to the bar of his native State in 1830. In 1838 he was chosen one of the associate justices of the supreme court of New Jersey, which position he resigned in November 1841; and in 1842 was appointed by the governor to fill a vacancy in the United States Senate. At the expiration of his term he resumed the practice of his profession at Trenton; and in 1856 was nominated by the Republican national convention as their candidate for the vice-presidency of the United States, with Fremont as the candidate for President. He was attorney-general of New Jersey 1857–61, and was minister to France 1861–4.

Dayton, Ky., city in Campbell County, on the Ohio River, and the Chesapeake & Ohio Railroad. Some of the manufactures are watch cases, pianos, whiskey; and the public buildings are good churches and schools and the Speers Memorial Hospital. Pop. (1901) 6,203.

Dayton, Ohio, city and county seat of Montgomery county, at the confluence of the Great Miami and Mad Rivers and Stillwater and Wolf creeks. It is on the Erie; the Dayton and Union and the Pittsburg, Cincinnati, Chicago and Saint Louis railroads, 67 miles southwest of Columbus and 60 miles north of Cincinnati. There are 125 trains entering the city daily. The Union Station was opened to the public in July, 1900, and cost including tracks $900,000. The city has an area of 10.4 square miles.

Government.— The Mayor, Treasurer, Auditor, Solicitor, Board of Public Service, of three members, are elected by popular election. The Board of Public Safety, of two members, and the Board of Health are appointed by the Mayor and confirmed by Council. The City Council, composed of 13 members from 10 wards, is elected by popular vote, for two years, each member receiving an annual salary of $250. It is a legislative body only. The supply of water for the city is almost inexhaustible in quantity and of almost absolute purity. In 1904 there were 133 miles of street mains, 1,300 fire hydrants, 15,503 service taps. The Fire Department has a force of 90 men, 14 engine-houses, 50 horses maintained at a cost of $86,728.48 and with property worth $375,000. A complete system of surface and under-ground sewerage, both Storm and sanitary, is provided. In 1904 there were 67.9 miles of Storm sewerage.

Municipal Finances.— On 31 Dec. 1903 the citys financial statement was as follows: Assessed value of taxable property, $47,250,640; real value of taxable property (estimated), $100,000,000; total bonded debt, including this issue, $2,925,000; cash value of sinking funds, $157,000; bonded debt of city (net), $2,768,000; water works bonds included in total debt, $908,000; tax rate per $1,000 valuation, 28.60.

Banks and Banking.— There are seven National Banks and two Savings and Trust Companies. A report of the condition of the National Banks in 1904 showed that the aggregate capital stock was $2,400,000; surplus, $625,000; undivided profit, $561,412.51; with a total of loans and discounts of $7,708,178.75; deposits, $7,580,288.51 and a circulation of $563,700. One of the savings and trust companies has a capital and surplus of $250,000 and the other a capital of $275,000. The Clearing-House reports for 1903 were $86,807,030.41; for 1902, $76,491,771.15. The Internal Revenue receipts for 1903 were $2,017,670.07. Dayton takes rank as foremost in building associations of any city of its size in the country. The large number of the 20,000 or more homes in the city have been built with the aid of these associations. There are 12 associations with an aggregate authorized capital of $49,400,000 and capital assets $13,013,841.11.

Manufacturing Interests.— While Dayton's manufacturing industries are widely diversified and include the manufacture of cash registers, railroad cars, water-wheels, agricultural implements, sewing machines, foundry work, etc., these are conducted on so large a scale that many establishments employ from 500 to 2,500 hands. According to the U. S. census of 1900, the average number of wage-earners in the city was 16,869; the total wages paid was $7,050,792 and the value of the productions was $35,697,695. Great progress was made since 1900 and careful estimates show that in 1903 the average of wage-earners had increased to 20,740 with a total wages paid of $10,180,619 and the value of the products $46,596,875.

Street Railways.— A potent force in the development of the city has been the electric traction lines, of which Dayton has more than any other city in Ohio. There are nine lines, with a total mileage of 385 miles, which radiate in all directions through the populous and rich country of which Dayton forms the center. The city railway lines, three in number, have a total mileage of 70 miles and render excellent service.

Education.— The Dayton public school system has for many years enjoyed the reputation of being one of the best in the West. On 31 Aug. 1903 there were 48 schools, 23 district schools and one High School with 37 teachers and 1,058 pupils and with property valued at $326,252. There is one Normal School with an attendance of 67, 22 Kindergartens with an attendance of 1,058, one Manual Training School with an attendance of 1,710, and one school for the deaf. The total value of school property and equipments was $1,467,387. There are 10 Catholic Parochial Schools with 94 teachers and 3,023 pupils and two Lutheran Parochial Schools with 89 pupils and also three large colleges and seminaries for Catholic youth and four well-attended Business Colleges, one of which, the Miami Commercial College, was established in 1860. The Union Biblical Seminary is the training college of the United Brethren denomination of the United States and a very successful Arts and Crafts Society is doing excellent work. There are 90 churches in the city. Valuable adjuncts to the churches are the Young Men's Christian Association and the Young Woman's Christian Association and the Woman's League and a number of lesser church associations.

Public Library.— Dayton had the first library incorporated in the State, one having been established in 1805. The Public Library was opened in 1855 and is supported by public taxation, having an income of $18,000 per annum. The total number of volumes recorded 1 Jan. 1904 was 63,133. There are five daily newspapers, each with weekly editions, besides 17 church and other publications. There are also three large church publication houses.

Hospitals.— The city hospitals include the Saint Elizabeth Hospital, the Miami Valley Hospital, and the Protestant Hospital which has a large central building known as the Frank Patterson Memorial of Operative Surgery, one of the most complete buildings for its purpose in the United States. The Dayton State Hospital for the insane is maintained by the State. The Hospital of the National Military Home which adjoins the city is the largest military hospital in the world and has an average of 600 patients, all of whom are Veteran Volunteer Soldiers of the Civil and Cuban War.

History.— The town was laid out in November 1795 by Gen. Israel Ludlow and was named after Gen. Jonathan Dayton. The first settlers arrived in the spring of 1796. Situated in the Miami Valley, one of the most fertile valleys in the United States, producing for many years great crops of corn, wheat, tobacco and numerous cattle, sheep and horses and with abundant water power to develop its industries, Dayton has grown to be the third largest manufacturing city in the State. With its industries so diversified, its banks and building associations so strong and uniformly successful and with its people so well educated, it is one of the richest and most prosperous communities in the Union.

Population.—(1880) 38,678; (1890) 61,229; (1900) 85,333; (1904), estimated, 100,000.

A. D. Wilt,
President Miami Commercial College.

Dayton, Tenn., city and county-seat of Rhea County; on the Cincinnati, New Orleans & Texas Pacific Railroad; about 75 miles southwest of Knoxville. It is in the centre of a coal-mining district; and iron, machinery, lumber, bricks, and flour are the chief manufactures. Pop. 2,120.

Dayton, Wash., city and county-seat of Columbia County; on the Touchet River, and the Washington & Columbia River, and the Oregon railroads. It is about 28 miles, in direct line, northeast of Walla Walla and 50 miles southwest of Colfax. It is situated in one of the best agricultural regions of the State, and its trade is largely in agricultural products and cattle. It contains stores, large flouring-mills, and well-built churches and schools. Pop. 2,300.

Daza, dä'zä, Hilarion, Bolivian general and ex-president: b. Sucre 1840; d. 28 Feb. 1894. In 1857 he enlisted as a soldier in the famous battalion of Col. Balsa, and was rapidly promoted. On 24 Nov. 1870, by an act of treachery he deprived President Melgarejo of office, and defeated him in an engagement 15 Jan. 1871. After that he was practically the arbiter of the destinies of the country for several years. By the *coup d'etat* of 4 May 1876 he became president in place of Frias. The army deposed him 27 Dec. 1879. He went to France, but after a few years returned to Bolivia, and in that country was assassinated.

D'Azeglio. See Azeglio, Massimo Taparelli, Marquis d'.

Deacon (from the Greek *diakonos*, a servant), a person who belongs to an inferior order of ministers in the Christian Church. Seven were apparently first instituted by the apostles (Acts, chap. vi.), which number was retained a long time in several churches.

In the Roman Catholic Church, a sacred minister whose functions are to assist the priest in the liturgical service and in the administration of the sacraments; also in emergencies to baptize, to preach, and to administer the Eucharist. These three functions it is not lawful for the deacon to discharge without express authority from the bishop save in case of necessity. But in the first ages of the Church it was the deacon that gave the communion, in both species, to the faithful in the public liturgical service and at their homes in case of sickness. In the present usage of the Church the diaconate is, save in exceptional cases, simply a step toward the priestly state and office and for the deacon as such there is no recognized place in the economy of the Church.

In the English Church, also, the diaconate is merely a step toward the priesthood, and the deacon's duties are all in the way of assisting the priest. He preaches only by episcopal permission, and he cannot consecrate the elements

of the Lord's Supper, or pronounce the absolution. No person can be ordained deacon before he is 23 years old, except by dispensation from the archbishop of Canterbury. The office of deacon in other churches varies considerably, and does, of course, have no functionaries bearing this name.

In the Methodist Episcopal churches, the junior order of the priesthood, the novitiate being first ordained a deacon, and then after a term of satisfactory conditions have been fulfilled — such as progress in grace and gifts, and the probation of character — elevated to the full priesthood or eldership — the latter the highest order in the Church — the bishops occupying not a superior ecclesiastical order, but holding a merely supervisory office.

In the Presbyterian churches, the orders here are teaching elders, or ministers, ruling elders, generally called simply elders (these two orders looking over the spiritual affairs of the congregation); and deacons (now gradually being displaced in many places by managers), to attend to the more secular matters.

In the Congregational, Baptist, and other churches, deacons are spiritual officers ranking immediately after the minister, and looking after both the spiritual and the temporal concerns of the congregations.

Deaconesses, in the time of the apostles, were usually widows who assisted in the solemn baptism of women (by immersion), instructed female catechumens in the doctrines and usages of the Church, visited those of their sex who were sick or were in prison for the faith's sake, dispensed the alms of the faithful, and kept order in the women's part of the assembly room during the liturgical service. That the deaconesses were in the earliest times widows, and not maids or married women, appears from the curious fact that Saint Ignatius, disciple of St. John the evangelist, speaks of "virgins who are called widows"; as clear a proof of the original custom of choosing widows only to be deaconesses, as would be the formal declaration that such custom existed. For a long time it was required that the deaconesses should be not less than 60 years old; by the councils of Chalcedon and in Trullo the age of 45 years was made the minimum; by the Council of Chalcedon deaconesses were forbidden to marry; and no widow who had married a second time was ever admitted to the rank of deaconess. The institution of deaconesses was extinct in the western Church in the 10th century and in the Greek Church in the 12th; but it survives in churches of the Syrian rites.

The work done by the deaconesses in the early centuries is performed now, in the Roman Catholic, and in many of the Protestant Episcopal, churches by the nuns (see SISTERS). In the 19th century the order of deaconesses was revived in several of the Protestant churches. Theodore Fliedner (1836) of the United Evangelical Church of Prussia, founded a home for deaconesses, in Kaiserswerth, Prussia. Germany has several homes, and in 1855 the order was established in Baltimore, Md.

Dead, in nautical language, a word frequently employed as part of a designation or phrase having, in general, a meaning somewhat opposite to that of active, effective, or real. The chief of such phrases are the following: Deadeyes: circular, flattened wooden blocks, without sheaves, and having eyes for lanyards, which form a purchase or tackle whereby the shrouds or other parts of fixed rigging are extended or set-up taut; dead-flat: the name for one of the midship-timbers; dead-lights: strong wooden shutters used to close cabin windows, on the approach of a storm, to protect the glass; dead ropes: such as do not run in blocks; dead-wood: the term applied to the solid blocks of timber erected upon the keel throughout the sharp portions of a ship's hull at stem and stern, the chief object being to give solidity and strength to the ends of the ship.

Dead, Book of the, a name given to the great funerary work of the ancient Egyptians, who themselves entitled it 'Per-em-Hru,' "to go north from (or by) day." It is a collection of prayers and exorcisms composed at various periods for the benefit of the pilgrim-soul in his journey through Amenti (the Egyptian Hades); and it was in order to provide him with a safe conduct through the perils of that terrible valley that copies of the work, or portions of it, were buried with the mummy in his tomb. Such copies, hieroglyphic or hieratic, according to the age when they were executed, and made some to order, others for sale, constitute fully one half of the thousands of extant papyri. They are mostly corrupt and faulty in language. See BOOK OF THE DEAD.

Dead, Disposal of the. In every age and in all countries, the living have shown their respect for the dead by various modes of burial ceremony, and the religion and laws of all countries reflect in large measure this feeling of reverence for the memory of those who have gone before. The methods of disposal of the dead are many, and historic romance has preserved for us many interesting and pretty customs. In the main, however, three methods are largely employed by modern peoples — burial, embalming or its modifications, or cremation with its modifications. It is impossible to tell which method has the greatest antiquity, but probably simple burial antedated the others, since cremation and embalming usually imply a complex religious development. The Hebrews, the Greeks, and the Romans in the main, buried their dead, their burying-grounds having been located outside of town-walls; but cremation also was largely practised by the Greeks, and it has been thought that the Hebrews at one time likewise burned their dead. As is well known, embalming was widely customary among most of the nations of antiquity, although the Egyptians may be said to have been the foremost of those employing it.

The argument in favor of cremation is based principally on sanitary grounds, and despite the general sentiment against it, cremation has made considerable progress in the United States and other countries. There are crematories in many of the leading cities of America, and while much of the feeling against cremation has undoubtedly passed away, there is still great general dislike to burning of the dead.

Apart from methods of antiquity, the problem of disposing of the dead with least danger to the living is, from the medical point of view,

one of great interest. Its discussion is by no means of recent origin, however, for the early Italians, French, and English contributed learned treatises on the subject. It would seem that from the scientific point of view most of the modern writers and those of the Middle Ages strongly favor cremation as one of the cleanest and most efficient modes of disposal of the dead, and it is a matter of history how the ancient Etruscans and others had their burial urns in which to keep the ashes of their forebears.

The now universal method of burial beneath the ground is condemned by practically all sanitarians, but it will probably be many generations before the custom is abandoned, if indeed it is ever to be given up.

As to actual dangers that may arise from dead bodies buried beneath the ground, it cannot be claimed that these are imminent. Disease is mainly transmitted from the living person, and now that we have more definite knowledge of factors involved in the transmission of disease, the bogy of danger arising from burial has little terror for us. It can hardly be claimed with much show of justification that such a water-born disease as typhoid can originate from the water that may percolate through the ground in cemeteries and ultimately reach a potable supply. This danger is theoretical rather than practical, and the amount of time spent in devising methods to prevent such contamination would be much more rationally employed in taking care of the excreta of the living. The contamination of the earth, the air, and the water is, therefore, really of secondary importance; yet it cannot be denied that, excepting some exclusive cemeteries the present methods of burial are disgusting; and in times of war or pestilence not only is burial disagreeable, but there is no doubt that contagion may arise from it, and hence special portable crematories have an undeniable place. See CREMATION.

Dead-letter Office. See POST AND POSTAGE.

Dead-lights. See DEAD.

Dead-men's-fingers, an English fishermen's name for the *Alcyonium,* a genus of polyps, the typical one of the family *Alcyonidæ,* characterized by the polyps of the colony having eight hollow arms and eight mesenteries, and a skeleton composed of separate calcareous spicules. It contains many well-known species, such as *A. digitatum,* or sea-finger (dead-men's-fingers, known also to fishermen as dead-men's-toes, and cow's-paps), and *A. glomeratum.* A common species on the United States Atlantic coast is *A. carneum.* The name is also applied to certain species of branching sponges.

Dead-nettle, a common name applied to the genus *Lamium* of the natural order *Labiatæ,* mint family. It is an annual or perennial herb, of which there are about 40 species, all natives of the Old World. It has been naturalized in America, and several species are found in waste places and cultivated ground from New Brunswick to Florida and west to Ontario, Minnesota, and Arkansas. The best-known species are *L. purpureum* and *L. album,* which are used in the northern parts of Europe as pot-herbs. A species of the genus *Galeopsis* (*G. tetrahit*) is called dead-nettle, as is one of the species of *Stachys* (*S. palustris*). It was an old belief that the hairs of the dead-nettle, when dry, caused irritation to the exposed parts of persons coming in contact with the plant, and that this, extending through the system, sometimes caused death; hence the name.

Dead Reckoning. See DEAD.

Dead Sea, the usual name given to a most remarkable lake in the southeast of Palestine, called in the Old Testament "The Salt Sea," "Sea of the Plain," or "East Sea"; by Josephus, "Lacus Asphaltites"; and by the Arabs now, *Bahr-Lût,* "Sea of Lot." It is 46 miles long, with a breadth of from 5 to 9 miles. Its surface, which is lower than that of any water known, is 1,292 feet below the level of the Mediterranean. The depth of the greater part of the northern section is about 1,300 feet; but at the south end the water is only from 3 to 12 feet deep. The shape is that of an elongated oval, interrupted by a promontory which projects into it from the southeast. The Dead Sea is fed by the Jordan from the north and by many other streams, but has no apparent outlet, its superfluous water being supposed to be entirely carried off by evaporation. Along the eastern and western borders of the Dead Sea there are lines of bold, and in some cases perpendicular, cliffs rising in general to an elevation of 1,500 feet on the west and 2,500 feet on the east. These cliffs are chiefly composed of limestone, and are destitute of vegetation except in the ravines traversed by fresh water streamlets. The northern shores of the lake form an extensive and desolate muddy flat, marked by the blackened trunks and branches of trees, strewn about and encrusted with salt. The southern shore is low, level, and marshy, desolate, and dreary. On this shore is the remarkable ridge of rock-salt, 7 miles long and 300 feet high, called Khashm Usdom (Ridge of Sodom). Lava-beds, pumice-stone, warm springs, sulphur, and volcanic slag suggest the presence here of volcanic agencies at some period; but some modern geologists declare that no active volcanoes have ever existed in this vicinity; and that the subsidence of the Jordan Valley occurred in the Tertiary Period. On the other hand it is claimed by modern travelers that the neighborhood of the Dead Sea is frequently visited by earthquakes, and the lake still occasionally casts up to its surface large masses of asphalt. The long-entertained belief that the exhalations from this lake were fatal is not founded upon fact. Within the thickets of tamarisk and oleander which here and there may be seen upon its brink, the birds sing sweetly, and they fly over and swim about on its surface; but the salinity of the waters is adverse to life, though some lower organizations are found in them.

The water of the Dead Sea is characterized by the presence of a large quantity of magnesian and soda salts. Its specific gravity ranges from 1172 to 1227 (pure water being 1000). The proportion of saline matter is so great that, while sea-water contains only 3.5 per cent of salts, the water of the Dead Sea contains upward of 26 per cent, or more than eight times as much as that of the ocean. In all lakes or collections of water without any outflow, the water acquires an infusion of salt, its feeders constantly bringing in this material, while none can go off by evaporation, even when the shores do not as here abound in salt and nitre. The evaporation is great as the heat is intense, and the sea rather contracts than increases. Rain hardly ever falls;

its water is nearly as blue and clear as that of the Mediterranean, and though its taste is horribly salt and acrid, a bath in it is refreshing. Owing to the great specific gravity of the water, it is almost impossible for the bather to sink in it, strive as he may. Several of those who have navigated and explored the sea have fallen victims to a fatal fever. For the story of the 'Cities of the Plain,' see Gen. xix.; but according to Capt. Conder, 'it is now generally agreed that the Dead Sea and Jordan were formed by a great fault or crack in the earth's surface long before the creation of man, and that the district presents in our own days much the same aspect as in the days of Abraham. It is vain, therefore, to suppose that the 'Cities of the Plain' were beneath the present sea, though this view was held as early as the time of Josephus.' Steamboats are now in use on this lake.

Deadeye. See Dead.

Deadly Nightshade. See Belladonna.

Deadwood, S. D., city, county-seat of Lawrence County; on the Fremont, Elkhorn & Missouri Valley, and the Burlington & Missouri River railroads. It is one of the principal trade centres for the mining camps of the Black Hills. A considerable amount of the gold, silver, lead, and other valuable minerals found in the Black Hills is brought to Deadwood for smelting, refining, or reshipment. Besides the large smelter and the cyanide reduction works, there are manufactories for mining implements and machinery, brick, and planing-mills. The Masonic Temple is a large building. The first permanent settlement was made in 1876. Pop. 3,524.

Deaf-mutes, persons both deaf and dumb, the dumbness resulting from the deafness which has either existed from birth or from a very early period of life. Such persons are unable to speak because they have not the guidance of the sense of hearing to enable them to imitate sounds. Most deaf and dumb persons can hear some sounds, and some can distinguish a difference of pitch who perceive no difference in articulations.

The Eustachian tube extends from the tympanum into the throat; and sometimes sounds are better distinguished by opening the mouth when the external opening only is obstructed, hence the habit of "listening with the mouth open." Deafness occurs in every degree, from that which merely impairs the accuracy of the ear in distinguishing faint or similar sounds to that state in which there is no more sensation in this organ than in any other; and sound is felt in almost every part of the body as a mere vibration. Among the causes assigned for congenital deafness are consanguineous marriages, hereditary transmission, scrofula, certain local or climatic conditions, ill-health of the mother during pregnancy, etc. Though mere consanguinity can hardly be regarded as of itself a cause of this defect, yet it is an established fact that a great proportion of the deaf and dumb are the offspring of consanguineous marriages, especially of marriages between first cousins. Deafness is frequently a family trait, though it has been shown that the defect comparatively seldom descends directly from parent to child, though present in various collateral members of the family. For the causes of acquired or accidental deafness, see Deafness. Where partial or complete dumbness occurs and the sense of hearing is perfect, it will often be found to have its origin either in extreme nervous debility or in some mental derangement, and not in defective organs of speech, which in those deaf from birth are almost without exception in their normal condition. In the greater proportion of deaf-mutes no defect is visible, or can be detected by anatomical examination. The necessity of communication, and the want of words, oblige the deaf-mute to observe and imitate the actions and expressions which accompany various states of mind and of feeling, to indicate objects by their appearance and use, and persons by some peculiar mark, and to describe their actions by direct imitation. In this way there is formed a natural sign language. This language, when employed by an insulated deaf-mute, will usually exhibit only the objects of the first necessity and the most common impulses, like the language of a savage tribe. When his ideas expand from age or observation he will find new modes of expressing them; and when his education is begun an intelligent deaf-mute will often express ideas in this language for which it is difficult to find expression in words. When a number of deaf-mutes are brought together in a single institution, selections and combinations of their various dialects are formed; the best are gradually adopted by all; and a new and more complete form of the language is the result. This process, systematically carried on for years in deaf and dumb institutions at Paris and elsewhere, under the observation and direction of intelligent supervisors, has produced a language capable of expressing all the ideas we convey by articulate sounds with clearness, though not always with equal brevity. This language appears to have remarkably close resemblance to that used by the Indians of North America. (See Sign Language.) The Teutonic race being less disposed to the use of gestures and less ready than certain other peoples of Europe in the acquisition of the sign language, has not been so prompt to adopt it as an auxiliary in the education of deaf-mutes.

In ancient times and even through the Middle Ages it was the generally received opinion that deaf-mutes were not capable of being educated, nevertheless a few exceptional cases have been noted. Aristotle, Pliny, and Lucretius refer to this class of defective persons, and they were held by the code of Justinian as legally incapable of entering into a contract. In ancient Rome two dumb painters attracted considerable attention. About 700 A.D., according to the Venerable Bede, Bishop John of Hagunstaldt (Hexham), taught a deaf-mute to speak. The humanist Agricola (q.v.) speaks of meeting a deaf and dumb man who had learned to write. In the middle of the 16th century, Pasch, a clergyman of Brandenburg, instructed his daughter, a deaf-mute, by means of pictures. The first effort of which we have a distinct account, was made by Pedro de Ponce, a Spanish Benedictine, who instructed three deaf-mutes, of noble families, to write and speak, in 1570. His system appears to have been adopted by a countryman of his, a monk, Juan Pablo Bonet, who, in 1620, published a treatise on the art of instructing the deaf and dumb, accompanied by a manual alphabet. In 1648 John Bulwer, physician, published the earliest work in English on the instruction of the deaf and dumb, entitled 'Philocophus, or The Deafe and Dumbe Man's Friend'; in 1644 he had already

published 'Chirologia, or the Natural Language of the Hand.' This was followed by Dr. W. D. Holder's 'Elements of Speech, an Essay of Inquiry into the Natural Production of Letters; with an Appendix Concerning Persons that are Deaf and Dumb' (1669). George Dalgarno, who was a native of Scotland, published in 1680, 'Didascalocophus,' or 'The Deaf and Dumb Man's Tutor.' To Dr. John Wallis (q.v.) is generally ascribed the merit of having been the first Englishman who succeeded in teaching deaf-mutes. The results of his labors on his first pupil were exhibited before the Royal Society in 1663; and in 1670 an essay of his on this subject was published. Contemporary with these philanthropists in England were Baron F. von Helmont and Dr. John Conrad Amman, in Holland, the latter of whom published in 1690 his celebrated work, 'Surdus Loquens.' Toward the middle of the 18th century various teachers arose in different parts of Europe. In 1743 the practicability of instructing deaf-mutes was first publicly demonstrated in France by Pereira, a Spaniard, before the Academy of Sciences, which gave its testimony to the success of the method. About the same time the Abbé De l'Epée, who devoted his life and fortune to this subject, introduced a system for the instruction of the deaf and dumb, which was taught with great success in the Royal Parisian Institution, and afterward still further developed by his pupil and successor, the Abbé Sicard. In 1778 the first public institution for the education of deaf-mutes was established at Leipsic, through the labors of Samuel Heinicke, the great upholder of the vocal, oral, or articulatory system. His followers admitted the use of the sign language in the early stages of instruction, but sought to banish it as early as possible, considering it as a rude language, incapable of improvement, and which retarded the expansion of the pupil's mind, and rendered it less necessary for him to attend to written language. They believed that no freedom in thought or in expression could be produced without articulation. Although the results of instruction by the French method seemed to disprove these views, yet the pupils of the Abbé de l'Epée and Abbé Sicard have been charged with being very mechanical in their use of signs, and having little power of original thought or sentence construction.

In 1760 Thomas Braidwood established near Edinburgh a deaf and dumb school on the articulating system, which was visited by Dr. Johnson during his tour in Scotland. It was removed in 1783 to Hackney, near London. A day-school for the instruction of deaf-mutes was established by Don Pascal de Pietro at Rome in 1784. The first public institution in Great Britain for the gratuitous education of the deaf and dumb was founded at Bermondsey in 1792 by Townsend and Mason. From this establishment originated the London Asylum in Kent Road, which was opened in 1807. In 1810 a school for affording instruction gratuitously to the dumb was founded in Edinburgh, and others of a similar description were subsequently established at Birmingham, Glasgow, Manchester, and other towns. The method employed most widely in Great Britain was for a considerable time nearly the same as that employed by Sicard in France, but the German oral system was afterward largely adopted, and in 1869 the method of Alexander Melville Bell was introduced. At the international Congress held at Milan in 1880 the oral system received almost unanimous approval, and its use was adopted in the deaf and dumb institutions of Italy, Germany, Holland, and Austria. The commissioner appointed by the French government to investigate the subject pronounced in favor of the oral method, in 1881; but later a mixed or intermediate method was advised by a congress on the subject. In 1817 the first American asylum for deaf-mutes was founded in Hartford by Thomas Hopkins Gallaudet, who followed a method comprising many of the best features of the Paris school with some others of great importance peculiar to himself. His son, Dr. E. M. Gallaudet, afterwards founded, in Washington, a college for deaf-mutes. The New York Institution was founded in 1818, and the Philadelphia Asylum in 1820. The word institution or school supplanted the term asylum, when the teaching of deaf-mutes became recognized as properly a part of the general work of public instruction coming under the care of the individual States.

The Bell method of teaching deaf-mutes, which is known as the system of "visible speech," is now in extensive use. There is in Boston a training college for instructing teachers in this method. It was introduced into the Clark Institution at Northampton, Mass., in 1872. The characters of the alphabet on which this system is founded are intended to reveal to the eye the position of the vocal organs in the formation of any sound which the human mouth can utter. (See VISIBLE SPEECH.) Alexander Graham Bell (q.v.), son of the originator, and well known for his own scientific inventions, was the first to employ this alphabet in the teaching of deaf-mutes in America. The career of Helen Keller has done much to direct public attention to this method.

Articulation is learned by the deaf-mute as a set of movements and sensations in the organs of speech. It is taught by pointing out to the pupil the positions of the lips, teeth, and tongue, in pronouncing the vowels and consonants by making him feel with his hands all the perceptible movements and vibrations of the throat and other organs which are requisite for their pronunciation and by using diagrams, etc. He is then required to imitate these positions, and to force a quantity of air from the lungs sufficient to produce the sounds, and is taught to read the articulations of others, by observing the position of the organs and the countenance. The facility of doing this will depend much upon the pliability of the organs of speech, and the nature of the language to be learned. Some advocates of articulation believe that, by that portion of the pupils of every institution whose organs are pliable and who have some remnant of hearing (those termed *demisourds* in the Paris school), the acquisition may be made with a degree of ease and perfection which renders it an important branch of instruction for them. But they are equally convinced that to attempt to teach articulation to those entirely destitute of sensibility in the ear, or who cannot exercise the organs of speech without difficulty or pain, is a useless labor, and may produce disease in the pupil.

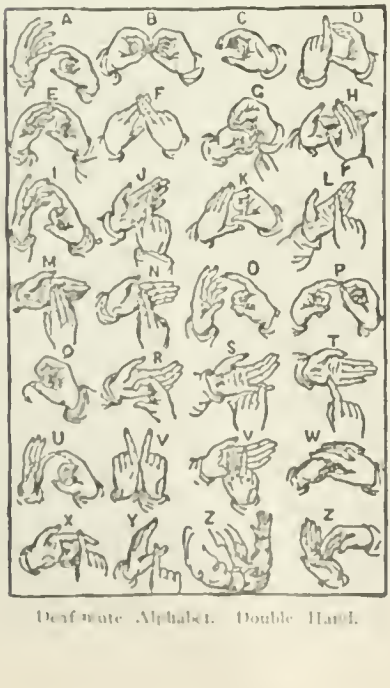
The sight of deaf-mutes is sometimes so well

trained that they prove very proficient in lip-reading, and if, in addition, their articulation is distinct they can carry on considerable conversation with persons who know nothing of the sign language or of the manual alphabet, cases being known where persons have conversed with the deaf and dumb and remained ignorant that those to whom they were speaking were afflicted in this way.

There are two kinds of manual alphabet, the double-handed alphabet, where the letters are expressed by the disposition of the fingers of both hands; and the single-handed, in which the letters are formed with the fingers of one hand.



Deaf-mute Alphabet, Single Hand.



Deaf-mute Alphabet, Double Hand.

Spelling by the hand is not a part of the sign language but is frequently acquired in addition to the latter and is very commonly used, being an art easily acquired.

In 1903 much interest was aroused by the testing in New York of the acousticon, an instrument devised for enabling the deaf to hear. The inventor, Mr. Hutchinson, had previously exhibited it in England, and the tests in both cases appeared to be remarkably encouraging. The acousticon is a device involving all the important principles of the telephone, with improvements for giving intensity to sound waves. It is in three pieces, which may be carried in the pocket. The one answering to a telephone transmitter is a vulcanized rubber disk about three inches in diameter. To its back is attached a hook by which it may be suspended from a waistcoat pocket. The reverse face of the disk is hollowed and in the hollow certain gases are hermetically sealed. The other two pieces are the earpiece, which corresponds to the receiver of a telephone, and the battery. The latter is about three inches long, two inches wide and half an inch thick. Wires connect the three pieces of the machine. The sound that is to be transferred is caught by the receiver and intensified before it passes to the ears of the subject.

In 1901 Germany led the European states in the number of schools for the deaf, having 98. In France there were 70 such schools, in Great Britain and Ireland 46, in Italy 35, in Austria-Hungary 19, in Norway and Sweden 17, in Switzerland 13, in Russia 13, in Spain 7. There are about 23 other institutions for deaf-mutes in various parts of Europe, and India and Japan have established a few schools. In Canada there are 7, and the United States leads the world with 103 public and 15 private institutions of this nature. Fifty-seven of the public schools are State institutions and 46 are day schools. In the State institutions there were, in 1901, a total of 10,069 pupils. Some are taught by the manual method, others by the purely oral; but the larger number of schools prefer a combined method. Manual training is an important feature in schools for deaf-mutes. There are also six periodicals in the United States devoted to the interests of deaf-mute instruction. The proportion of deaf-mutes in the United States is 1 to 2,400. There were on 1 June 1890 a total of 121,178 deaf persons, of whom 40,502 were deaf-mutes, and 80,011 were able to speak. See DEFECTIVES, EDUCATION OF.

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Deaf-mutes, Teaching Speech to. The fact that deaf-born infants make the same babbling efforts to talk as hearing ones and also the fact that a few mothers by giving them the same repetition through their eyes, of the beginnings and progress of language, as they gave their hearing children through their ears, resulting in these deaf children acquiring articulate language and the ability to understand the spoken language of others, induced Emma and Mary S. Garrett to make the experiment of applying this same treatment to the deaf in general.

The experiment began 2 Feb. 1892, as a private effort, with 11 deaf children in a little old building in West Philadelphia, Pennsylvania. In July 1893 it became a State Institution under the title of Home for the Training in Speech of Deaf Children before they are of School Age, and between then and now two large cottages have been erected at Belmont and Monument Avenues, Philadelphia, Pa., on the confines of the Park, each capable of holding 30 children and both of which are constantly filled.

Deaf children are received between the ages of two and eight, the nearer the minimum age the better. Their training is made to conform as nearly as possible to the proper training of normal children. Their lack of hearing every word spoken in their presence, which is the way hearing children learn language, is supplied by intelligently giving them enough repetition of ordinary language through the eye to equal this. Except for this, their training is identical with that of normal children. No signs or motions are ever used to convey ideas to their brains; articulate speech alone is used. There are no vacations as there is no break in the summer in the acquirement of language by hearing children. The results are that all children who have *completed* the training are attending ordinary schools with hearing children; the only special thing required for them being a seat where they can see the teacher's face. Deaf boys, who after completing their preparatory training in the Home have been several years in public schools for hearing children, are learning their trades among hearing people among whom they must ply them. Reports from teachers and employers alike confirm the ability of these children to keep abreast of their classes in school and their fellow workmen in the shops.

These results would not be possible with deaf children deprived of any part of the opportunities which all hearing children enjoy for the development of the powers which they possess in common, nor can any better medium for this be devised than the natural one of articulate speech and language. These are also the medium of communication in the hearing world in which they must pass their lives, and a knowledge of them is indispensable to their usefulness and happiness.

There is no reason physical or mental for depriving deaf infants of learning articulate speech and language at the natural age and they evidence their aptitude to acquire them by babbling in earliest infancy just as hearing babies do.

MARY S. GARRETT,
Principal and Founder of Home for the Training in Speech of Deaf Children before they are of School Age, Belmont and Monument Avenues, Philadelphia, Pennsylvania.

Deafness, a condition in which there is loss of hearing, partial or complete, due to disturbance or destruction of some part of the hearing apparatus, either external or internal. Deafness may be acquired during life, or may be congenital. In most cases of congenital deafness, deaf-mutism results. (See DEAF-MUTES.) Of the acquired forms of deafness, those resulting from disease and destruction of some portion of the middle ear are the most common. Otitis media (q.v.), the commonest cause, may occur at all ages, and is a very frequent accompaniment of some of the acute infectious diseases, particularly measles, scarlet fever, and influenza. In these there is an inflammation in the nose and pharynx. The inflammation ascends the Eustachian tube and, being accompanied by some of the ordinary pus micro-organisms, notably the *Staphylococcus pyogenes aureus,* causes the formation of an abscess in the middle ear. This gives rise to severe earache, and finally to rupture of the drum and discharge of the pus. In many such cases recovery is complete, but in others there is partial destruction of the small bones of the conducting apparatus or even more important structures, resulting in partial or complete deafness. In the aged, chronic inflammation of the middle ear from nasopharyngeal catarrh is perhaps the most common cause of deafness. The middle ear contributes nearly three fourths of all cases of deafness, the external ear a little less than a quarter and the internal ear a very minute remainder.

Deak, dā-āk', **Ferencz,** Hungarian statesman: b. Söjtör, Zala, Hungary, 17 Oct. 1803; d. Budapest 29 Jan. 1876. Having studied law at Raab, he practised for some time as a barrister, but his political career began with his election to the National Diet in 1832. He soon became, in spite of his loyalist and conservative tendencies, a prominent member of the liberal opposition. At the revolution of 1848 he became minister of justice, but retired when Kossuth obtained power. On the defeat of the patriots in 1849 he retired from public office and did not return till the Franco-Austrian war gave him an opportunity of serving his country. He is regarded as the master-spirit of the movement by which the ancient independence of his country was restored in 1867. Though the leader of the liberal party, he constantly refused office, but no change in the ministry was made without his consent. See Forster, 'Francis Deák, Hungarian Statesman' (1880).

Deakin, Alfred, Australian cabinet officer: b. near Melbourne, Victoria, 3 Aug. 1856. He was educated at Melbourne University; was minister of public works and water supply, 1883–6; solicitor-general 1885; chief secretary 1886–90; member of federal council 1889–95–97–99; and has been attorney-general of the commonwealth of Australia from 1901. He has published 'Irrigation in Western America' (1885); 'Irrigation in Egypt and Italy' (1887); 'Irrigated India' (1892); 'Irrigation in Australia' (1893); 'Temple and Tomb' (1894).

Deal, in the United States, a plank 12 feet long, 11 inches wide, and 2½ inches thick. Deals are sawed of other sizes, but are reduced to that cubic dimension in computing them. The name deal is applied in Europe to boards of fir above 7 inches in width and of various lengths exceeding 6 feet. If 7 inches or less wide they are

called battens, and when under 6 feet long they are called deal ends. The usual thickness is 3 inches, and width 9 inches. The standard size, to which their sizes may be reduced, is $1\frac{1}{2}$ inch thick, 11 inches broad, and 12 feet long. Whole deal is deal which is $1\frac{1}{2}$ inch thick; slit deal, half that thickness. Deals are exported from many parts of Europe and the American continent. In the timber trade 50 cubic feet of deals are a load, and 100 feet superficial are a square.

Dealfish, deep-sea bony fishes of the family *Trachypteridæ*, allied to the oar-fish and the ribbon-fish (qq.v.). As the name suggests, the elongated body is laterally compressed, and with the exception of a small separate elevated anterior portion, the dorsal fin is continuous along the back. The anal fin is absent. The tail-fin is peculiar in being sharply turned upward. The skeleton is very fragile. Some eight species are known from specimens accidentally thrown ashore on European coasts and from the west of South America.

De Amicis, Edmondo. See AMICIS, EDMONDO DE.

Dean, Amos, American jurist: b. Barnard, Vt., 10 Jan. 1803; d. Albany, N. Y., 26 Jan. 1868. He early acquired eminence in his profession and after being professor of medical jurisprudence in the Albany Medical School and of law in the Albany Law School, became chancellor of the University of Iowa in 1855. Among his published works are: 'Lectures on Phrenology'; 'Manual of Law' (1838); 'Medical Jurisprudence' (1854); 'Bryant and Stratton's Commercial Law' (1861).

Dean, John Ward, American genealogist: b. Wiscasset, Maine, 13 March 1815; d. Medford, Mass., 22 Jan. 1902. He was educated in the public schools of Portland, Maine, learned the bookbinding trade and conducted a bookbinding business in Boston for many years, till his appointment in 1872 as librarian of the New England Historic Genealogical Society. Save from 1889 to 1893 he filled this position until his death. He was editor of the 'New England Historical and Genealogical Register,' and of nine volumes of the 'New England Bibliopolist' 1880–98. Among his writings are numerous biographical memoirs, including the 'Memoir of Nathaniel Ward' (1868); 'Memoir of Michael Wigglesworth' (1871); and the 'Story of the Embarkation of Cromwell and his Friends for New England.'

Dean, in ecclesiastical language, a church dignitary presiding over the chapter of a cathedral. The word is from the French *doyen* and from the Latin *decanus*, one set over 10 (Gr. *deka*, Lat. *decem*, 10). Originally *decanus* was the designation of a petty civil functionary: its ecclesiastical use had its rise in monachism, where a *decanus* was named to be chief and monitor of 10 monks or 10 hermits; and the senior *decanus* of a *cœnobium* served as head of the monastic community in the absence of the abbot. From the institution of canons regular, serving in the chapters of cathedral churches, came the usage of naming the chief among the canons of a chapter as its dean. Rural deans are parish priests who, appointed by the bishop, exercise a certain jurisdiction and supervision over the churches or congregations and their rectors within a definite district in a diocese. In the Curia Romana, the dignitary styled Cardinal Dean of the Sacred College is the chief among the cardinals and is usually the oldest of the seven cardinal bishops: he succeeds his predecessor in the see of Ostia. From ecclesiastical usage the term dean was adopted as designation of the leading member of various secular bodies, for example, the head of a university faculty, or a college, or of a guild.

In the Church of England some of the deaneries are valuable benefices. A dean may hold one other living along with his deanery. He is bound to reside eight months of the year at his cathedral. The Bishop of London holds the honorary office of dean of the chapel royal, and there is also a sub-dean and chaplains. Rural deans are beneficed clergymen appointed by the bishop or archdeacon to exercise jurisdiction in certain matters in some part of the diocese. This office had fallen into disuse, being superseded by the appointment of archdeacons, but has latterly been revived. The rural deans hold office during the life of those by whom they are appointed. There are also a few deans called deans of peculiars, who exercise an independent jurisdiction, and are not under a bishop. Deans of colleges are, in English universities, officers appointed to superintend the behavior of the members, and to enforce discipline. In the universities of Scotland and elsewhere the head of each of the faculties of law, theology, medicine, science, etc., is called dean of the faculty. The dean of guild in Scotland is a burgh official whose duty it is to see that buildings are erected in accordance with the municipal regulations. In Scotland the honorary title of dean of the chapel royal is bestowed on a clergyman of the Established Church, and six chaplains are also appointed to a similar honorary office. In universities in the United States the dean of a department is the registrar or secretary, and in some institutions he has considerable to do with the discipline.

Deane, Charles, American antiquarian: b. Biddeford, Me., 10 Nov. 1813; d. Cambridge, Mass., 13 Nov. 1889. He was for many years a merchant in Boston but retired from business in 1864 and devoted himself to the collection of works relating to American history. He edited 'Bradford's History of Plymouth Plantation' (1856); 'Wingfield's Discourse of Virginia' (1860), etc.

Deane, Silas, American diplomatist: b. Groton, Conn., 24 Dec. 1737; d. Deal, England, 23 Aug. 1789. He was graduated at Yale College in 1758, and was a member of the first Continental Congress in 1774. He was sent by Congress to France as a political and financial agent, with instructions to ascertain the temper of the French government concerning the rupture with Great Britain, and to obtain supplies of military stores. But he did not confine himself to his instructions, but made promises and engagements on all sides, which afterward brought the Congress into considerable embarrassment. When it was determined to send ministers to negotiate treaties, Dr. Franklin and Arthur Lee were commissioned to join him at Paris, and he assisted in the negotiation of the treaty with France. In consequence of the extravagant contracts he had entered into, he was recalled 21 Nov. 1777, and John Adams appointed in his place. He left Paris 1 April 1778, and upon his return, being called upon to give an account of

his proceedings on the floor of Congress, evaded a complete disclosure upon the ground that his papers were in Europe. He then attacked his fellow commissioners and Congress itself in a public manifesto for the manner in which he had been treated, but did not succeed in removing the public suspicion from himself. He afterward published in 1784 'An Address to the Free and Independent Citizens of the United States' on the same subject, and returning to Europe, died in great poverty. See 'Papers in Relation to the Case of Silas Deane' (1855).

Deans, Jeanie, the heroine of Sir Walter Scott's tale, 'The Heart of Midlothian.' When her sister Effie was sentenced to death for the murder of her own child, Jeanie went on foot to London and obtained from the queen a pardon for her sister. Her devotion forms a contrast to the attitude of the father, David Deans, whose rigid sense of justice leads him, in spite of the dictates of his heart, to drive Effie from his door. Effie is married to her lover and becomes a lady of the court.

Dearborn, Henry, American soldier: b. Hampton, N. H., March 1751; d. Roxbury, Mass., 6 June 1829. He was practising medicine at Portsmouth when, on hearing the news of the battle of Lexington, 20 April 1775, he immediately marched with 60 volunteers, and was at Cambridge early the next day, a distance of 65 miles. He was made a captain, was at the battle of Bunker Hill 17 June, and accompanied Arnold on the expedition through the woods of Maine to Quebec. He served as major under Gates at the capture of Burgoyne, and distinguished himself and his regiment by a gallant charge at the battle of Monmouth in 1778. In 1779 he served in Sullivan's expedition against the Indians, in 1780 with the army of New Jersey, in 1781 at Yorktown, and in 1782 was on garrison duty at Saratoga. He was twice member of Congress, and for eight years, during the presidency of Mr. Jefferson, secretary of war. In 1809 he was made collector of Boston, and on 27 Jan. 1812, became senior major-general in the United States army. Resigning his commission in the army in 1815, he was appointed, 7 May 1822, minister to Portugal, where he remained two years, and was recalled at his own request.

Dearth, Henry Golden, American painter: b. Bristol, R. I., 1863. He studied at the Ecole des Beaux Arts in Paris; and among his works are 'Evening' and 'Autumn.'

Death, in common language, a state opposed to life, and considered as the cessation of it. Strictly speaking, we can trace only the cessation of organic life. The matter of which the body is composed does not perish on the death of an organized being; it undergoes various changes, which are known by the names of decay and putrefaction, and which are the preparation for its becoming subservient to new forms of life. What becomes of the mind, or thinking principle, whether in man or animal, after death, is a matter of philosophical conjecture or religious faith. The investigations of science do not throw the least light upon it. The change here adverted to, which is called death, does not take place so quickly as is generally believed. It is usually preceded and caused by disease or the natural decay of old age. The state called death takes place suddenly only when the heart or the brain is injured in certain parts. Probably the brain and the heart are the parts from which, properly speaking, death proceeds; but as the cessation of their functions is not so obvious as the cessation of the breath, which depends on them, the latter event is generally considered as indicating the moment when death takes place. In the organs of sense and motion the consequences of death first become apparent; the muscles become stiff; coldness and paleness spread over the whole body; the eye loses its brightness, the flesh its elasticity; yet it is not perfectly safe to conclude, from these circumstances, that death has taken place in any given case, because experience shows that there may be from certain causes a state of apparent death, in which all these circumstances may concur without the extinction of the vital spark. The beginning of putrefaction, in ordinary cases, affords the first certain evidence of death. Putrefaction begins in the bowels and genitals, which swell, become soft and loose, and change color; the skin also begins to change, and becomes red in various places; blisters show themselves; the blood becomes more fluid, and discharges itself from the mouth, nose, ears, eyes, and anus. By degrees, also, the other parts are decomposed, and, last of all the teeth and bones. In the beginning of decomposition nitrogen and ammonia are produced: in the progress of it, hydrogen, compounded with carbon, sulphur, and phosphorus, is the prevailing product, which causes an offensive smell, and the light which is sometimes observed about putrefying bodies. At last, only carbonic acid gas is produced, and the putrefying body then smells like earth newly dug. A fat, greasy earth remains, and a slimy soap-like substance, which mixes with the ground, and contributes with the preceding decompositions to the fertility of it. Even in these remains of organized existence organic life is not entirely extinct; and they contribute to produce new vegetable and animal structures. Putrefaction is much influenced by external circumstances, particularly air, heat, and water. When the body is protected from the action of such agents it changes into adipocere (q.v.); but this process requires a much longer time than common putrefaction. In very dry situations the body is converted into a mummy, in which state bodies are found in the arid deserts of Africa, and on the mountains in Peru. Some vaults are remarkable for preserving corpses from putrefaction. It is well known to every reader that particular substances counteract putrefaction; for instance, those used in tanning, and in embalming mummies.

The death-agony is the state which immediately precedes death, and in which life and death are considered as struggling with each other. This state differs according to the cause producing it. Sometimes it is a complete exhaustion; sometimes a violent struggle, and very irregular activity, which at last, after a short pause, terminates in death. In some cases consciousness is extinguished long before death arrives; in other cases it continues during the whole period, and terminates only with life. The person in this condition has already somewhat the appearance of a corpse: the face is pale and sallow, the eyes are sunken, the skin of the forehead is tense, the nose pointed and white, the ears are relaxed, and the temples fallen in; a clammy sweat covers the forehead and the extremities, the alvine discharges and that of the urine take place involuntarily, the respiration becomes rattling, interrupted, and at length ceases

entirely. At this moment death is considered to take place. The time is of very different length; sometimes continuing for minutes only, sometimes for days. When the patient is in this condition nothing should be attempted but to comfort and soothe him. As long as the dying person is able to swallow, wine or other cordials may be given from time to time.

Signs of Death.—During death the larger physical processes, such as respiration and circulation, may first cease, but molecular activity may persist for some time, as is evidenced in the common observation of the growth of hair after death. The desirability of knowing the absolute signs of death is due not so much to the danger of burying the living, as to the possibility that efforts at resuscitation may not be adequately performed in cases of apparent death. The idea that at the present time people can be buried alive is more or less absurd; but it is very true that many cases of apparent asphyxia, notably following drowning or electrical shock, are recoverable if proper means are taken.

There are a number of conditions that simulate death. The commonest of these are catalepsy and trance states, partial asphyxia, and syncope or fainting. In catalepsy there is usually a loss of consciousness, the muscles of the body generally become very rigid, but the limbs may be readily moved and placed in various positions. The temperature is lowered, but the respiration and the heart-action, while reduced, are apparent. In trance the appearance of death is much more striking, consciousness is usually abolished, the face is pale, the limbs may be flaccid, and sometimes are rigid, the reflexes may be lost, and the pupils may be dilated and immobile. The absence of the signs of decomposition, the normal ophthalmoscopic appearance of the fundus of the eye, and the persistence of electrical excitability are sufficient, however, for determining this condition. Partial asphyxia by drowning is one of the most frequent causes of apparent death. Resuscitation has resulted even after a body has been under water for an hour. This fact emphasizes the desirability of continued treatment in all cases of asphyxia by drowning. Ordinary fainting is readily distinguished from normal death.

The special signs of death are those that involve the circulation, respiration, conditions of the muscular system, and certain changes in the eye. Circulatory changes are those of stoppage of the heart, with consequent loss of heat and coagulation of the blood. Careful listening to the heart-sounds by means of specially devised instruments may be necessary to determine whether the heart has stopped beating or not, and special methods of applying ligatures to the lobe of the ear or the finger, cutting off the venous return and permitting the ordinary inflow to continue, may be used. The respiratory changes consist of cessation of respiration, with consequent change in the color of the patient, there being marked pallor in distinction usually to marked cyanosis of asphyxia. A mirror placed before the nose or over the mouth will sometimes detect breathing when it cannot be seen or heard; and if a vessel of water be placed over the chest, movements of that organ may be detected. Muscular changes are very characteristic. There is usually complete muscular relaxation, followed by great stiffness (*rigor mortis*) after a certain number of hours. There is commonly loss of excitability of the muscles. Changes in the eye are corroborative rather than unique. The iris is usually flaccid; the pupil is ordinarily moderately dilated and irresponsive to light, and is not reacted upon by atropine or eserine half an hour after death. There is a marked anæmia of the fundus of the eye when viewed with the ophthalmoscope.

Finally there are a series of cadaveric changes that result and which are indubitable evidence of death. There is gradual loss of heat, although in certain cases of cholera temperatures as low as 70° F. have been observed, and the patient has still lived. *Rigor mortis* develops, probably, by the action of a ferment resulting in the formation of myosin. This condition may come on very rapidly, sometimes in a few hours, but complete *rigor mortis* rarely takes place within this time. Occasionally there is an instantaneous *rigor mortis*, when death occurs suddenly during violent muscular exertion. This happens in times of war, when weapons are sometimes firmly grasped in the dead hand; and in some cases of drowning the patients may be found with weeds and mud clutched in the fingers. The disappearance of *rigor mortis* usually takes place in from 16 to 36 hours, although there is no absolute rule. Coagulation of the blood, post-mortem hypostases, post-mortem lividities, and putrefactive decoloration, with formation of gases, are usually characteristic and unequivocal.

Death in Mythology, etc.—The representation of death among nations in their earlier stages depends upon the ideas which they form of the state of man after this life, and of the disposition of their gods toward mankind. In this respect the study of these representations is very interesting. Of later ages the same cannot be said, because imitations of representations previously adopted are very often the subjects of the plastic arts in such periods. However, these representations do not altogether depend on the causes above mentioned, as the general disposition of a nation (for instance, that of the Greeks, who beautified every object) has also a great influence upon them. The Greeks represented death as a pleasing, gentle being, a beautiful youth. They personified death under the name Thanatos, while the Kēres were rather the goddesses of fate and violent deaths, like the Valkyriæ in the northern mythology. According to Homer, Sleep and Death are twins, and Hesiod calls them the sons of Night. They are often portrayed together on cameos, etc. During the most flourishing period of the arts Death was represented on tombs as a friendly genius with an inverted torch, and holding a wreath in his hand; or as a sleeping child, winged, with an inverted torch resting on his wreath. Sleep was represented in the same manner, except that the torch and wreath were omitted. According to an idea originating in the East, death in the bloom of youth was attributed to the attachment of some particular deity, who snatched his favorite to a better world. It was ascribed, for instance, to Jupiter, or to his eagle, if the death was occasioned by lightning; to the water-nymphs if the individual was drowned, as in the case of Hylas; to Eos or Aurora if the death happened in the morning; to Selene, if at night, etc. These representations were more adapted to relieve the minds of surviving friends than the pictures of horror drawn by later poets and artists. (See Herder's 'Wie die Alten den Tod

gebildet.') Euripides, in his 'Alcestis,' even introduced Death on the stage, in a black robe, with a steel instrument in his hand, to cut off the hair of his victims, and thus devote them to the infernal gods. The later Roman poets represent Death under more horrible forms, gnashing his teeth, and marking his victims with bloody nails, a monster overshadowing whole fields of battle. The Hebrews, likewise, had a fearful angel of death, called Samaël, and prince of the world, and coinciding with the devil; but he removes with a kiss those who die in early youth. The disgusting representations of Death common among Christians originated in the 14th century; for the representation of Death as a skeleton merely covered with skin, on the monument at Cumæ, was only an exception to the figure commonly ascribed to him among the ancients. In recent times Death has again been represented as a beautiful youth — certainly a more Christian image than the skeleton with the scythe. The monument made by Canova, which George IV. erected in honor of the Stuarts in St. Peter's Church at Rome, represents Death as a beautiful youth. He is sometimes portrayed under the figure of a dying lion.

Causes of Death.— There are 15 principal causes of death, with the rate per 100,000, as given by the census bureau. They are as follows: Pneumonia, 191.9; consumption, 191.5; heart disease, 134; diarrhœal diseases, 85.1; kidney diseases, 88.7; apoplexy, 66.6; cancer, 60; old age, 54; bronchitis, 48.3; cholera infantum, 47.8; debility, 45.5; inflammation of brain and meninge, 41.8; diphtheria, 34.4; typhoid, 33.8; and premature birth, 33.7. Death from all principal causes shows a decrease during the last two decades, the most notable instance being that of consumption, which shows a decrease of over 50 per cent per 100,000. The world's death-rate is estimated at 68 a minute, 97,920 a day, and 35,740,800 a year.

Death-adder (*Acanthophis antarcticus*), a very venomous and justly feared snake of Australia, which also occurs throughout the Indo-Malayan Islands to the Moluccas. It belongs to the *Elapidæ*, of which the cobra is also a member, but the death-adder lacks the spreading "hood." The end of the tail is flattened laterally, and is terminated by a horny spine, anterior to which are several rows of enlarged scales which, as well as the habit of elevating and rapidly vibrating this region, does not materially differ from the characteristic rattle of the American rattlesnake.

Death, Civil, formerly the entire loss or forfeiture of civil rights, which followed on attainture for treason or felony. Formerly a man was considered civilly dead who retired into a monastery or abjured the realm. By Act 33 and 34 Vict. cap. xxiii. a conviction for treason or felony no longer causes attainder or forfeiture of civil rights.

Death, Dance of. See DANCE OF DEATH.

Death Duties. See INHERITANCE TAX.

Death-tick, a neuropterous insect of the family *Psocidæ*, of the size and appearance of the common plant-louse, one species of which is a visitor of gardens. Another species is the little book-louse found running over books and feeding on the paper. In England it is called "deathwatch," because there it is said to make a ticking sound like that of the beetle (*Anobium*), thus exciting many superstitious notions. See DEATHWATCH.

Death Valley, a low desert in Inyo County, Cal., near the Nevada border. The name of this region was given by a survivor of an emigrant party of 30 who, in 1849 or 1850, lost their way here, and of whom, after enduring indescribable sufferings, 18 perished in the sands. No other such spot is known. Like all the great valleys of California, it lies oblong from north to south. Its length is about 50 miles; width about 35; surface about 210 feet lower than that of the ocean. The Panamint Mountains shut out from it the moist winds of the Pacific. In the August atmosphere there is less than one half of one per cent of moisture. The surrounding country is made up of volcanic ranges — black, red, green, yellow, and brown — which have furnished the valley with the borax now found there.

On the north of the valley is Ralston Desert, on the west Panamint Desert, on the south Mojave Desert, and Amargosa Desert is on the east. Death Valley has the lowest depression. Summer heat here rises to 137° F. or more, far higher than anywhere else in the Western world. Death Valley, as seen from the summit of the Panamint Range, presents in November a long gray waste desert, in which there are narrow bands of white made by thin deposits of borax; and to the south is seen a thin line like a blade of steel — the Amargosa River, as it dies away upon entering Death Valley sink. It is a sluggish, dead stream, and evaporation and absorption at last take it all.

The land was the centre of a system of lakes when the Sierra Nevada had not yet risen. Toward their summit, the Panamint Mountains are of carboniferous limestone formation, rifted and worn, with a very slight growth of piñon, pine, mahogany, and juniper, near the crests; and below the vegetation becomes more scant. In the gorges and narrow cañons are seen numerous vines and creepers, on which grow wild gourds resembling oranges, also similar to the bitter desert apples that grow near the site of ancient Sodom. Here also are the most distorted forms of the cacti, and an inferior growth of greasewood or palaverde. The wealth of this desert is wholly mineral.

A sand-storm playing in Death Valley is a wonderful sight. Sand-augers rise like slender stems, reaching up into the burning atmosphere for thousands of feet and terminating in a hushy cloud. They travel hither and thither and gradually fade from sight. Here mirage raises up spectral cities, groves, fields, and tree-margined rivers. A low ruin will seem to be hundreds of feet high; arrow-weeds are magnified into stately palms; and crows walking on the ground appear as men on horseback. Besides crows, here are seen a few poor jack-rabbits, mangy coyotes, buzzards, horned toads, red-eyed rattlesnakes, mice and mountain rats; and in the Panamint Range there are still a few bighorns or Rocky Mountain sheep.

At the summit of the Panamint and Funeral mountains, the thermometer at times, it is said, falls to 30° below zero. The mineral wealth of this region is great. In the Panamint Range are many mines of antimonial silver ore, and copper, gold, iron, travertine, onyx, and marble are also found. In the Funeral Range, gold, silver, lead,

copper, and at many have been found in paying quantities, while the thick strata or measures of the east and southeast hills show almost inexhaustible quantities of colemanite or borate of lime named for W. T. Coleman, who was one of the first to discover this deposit and find out its richness in borax. Very rich gold quartz has been taken from mines along the route traveled by the ill-fated old emigrant party.

Human society in Death Valley is confined to a few miners in the Funeral, Cahco, and Panamint mountains, some few roving bands of Piute Indians, and a few squaw-men owning cattle and horses.

Visitors to Death Valley should not go earlier than 15 October, nor later than 15 April; no one should attempt to cross it while a sandstorm is blowing; a gallon of water is needed for each person in a party, and three gallons for each horse. At present one can go from Dagget on the Atlantic & Pacific Railroad, but the route is little better than from Panamint to Furnace Creek and up through Nevada via Pioche, Nev.

Death's-head Moth, a species (*atropos*) of *Acherontia*, genus of the Sphinx or hawk-moth family, one of the largest of the group, widely distributed over the world, being found in parts of Africa, Asia, and Europe. It is crepuscular in its flight. Its fore wings are blackish-brown, with transverse lines of black and a white spot near the middle. The hind wings are yellow, with black stripes crossing the middle and tracing the margin. Upon the dark thorax is described in pale yellow a mask resembling a man's skull. Hence the common name. The moth is about five inches in extent of wings. The caterpillar is of the same length, of bright yellow color, with violet stripes and a row of blue spots along the back. It is injurious to potato and tomato plants, and in some localities is said to rob beehives of their honey withstanding the attacks of the bees. When frightened or seized, the moth gives forth a squeaking noise. This, with the death's-head suggests an evil omen to the superstitious, making appropriate the generic name *Acherontia*.

Deathwatch, a small blackish beetle, about a quarter of an inch long, of the genus *Anobium*, common in Europe and America. It receives its ordinary name from the ticking sound which it makes in the woodwork of houses —6 to 12 distinct ticks being produced at regular intervals, like the clicks of a watch. These rappings are caused by the striking of the beetle's head on the hard wood, presumably to attract the attention of its mate. Both the beetle and the larvæ of several species are destructive of books, and are the real bookworms.

Debacle, dā-bä'kl (Fr. *dēbâcle*), a sudden breaking up of ice in a river; used by geologists for any sudden outbreak of water, hurling before it and dispersing stones and other debris.

Debain, Alexandre François, a-lĕks-ändr fran swa de-băn, French musical inventor: b. Paris 1809; d. there 3 Dec. 1877. He was a maker of musical instruments and invented the harmonium in 1840.

De Bary, Heinrich Anton, hīn'rīit an'tōn dā ba'rē, German botanist: b. Frankfort-on-Main 26 Jan. 1831; d. Strasburg 19 Jan. 1888. After a course of medical studies he began in 1853 to practise in his native city, but next year became a *privat-docent* in Tubingen, and the year after was called to be professor of botany at Freiburg, where in 1859 he was appointed ordinary professor. In 1867 he obeyed a call to Halle, and in 1872 to Strasburg, where he was the first rector of the newly reorganized university. As a botanist, De Bary is famous especially for the contributions he has made to our knowledge of the morphology and physiology of the fungi and the Myxomycetæ. Of his numerous works in these departments, the 'Comparative Anatomy of Phanerogams and Ferns' has been translated (1885); as also the 'Morphology of Plants' and 'Lectures on Bacteria' (1888).

Debat-Ponsan, Edouard Bernard, ā-doo-ār bār-nar de-ba-pôn-saṅ, French painter: b. Toulouse 1847. He was a pupil of Cabanel, and although he has produced some noted historical works, is chiefly known as a genre and portrait painter. He won the second grand prize 1872, a medal of the second class 1874, receiving the ribbon of the Legion of Honor 1881, and a bronze medal in 1889. He signed his name Ponsan-Debat until 1880. Among his works are: 'A Story of Phiietas' (1870); 'The First Mourning' (1874); 'Jephtha's Daughter' (1876), in the Carcassone museum; 'St. Paul upon the Areopagus' (1877); 'Devotion of St. Louis toward the Dead' (1879); 'A Door of the Louvre on St. Bartholomew's Day' (1880); and portraits of Dr. Pichaud (1874); Paul de Cassagnac (1882); Gen. Boulanger; etc.

Debatable Land, a district of country on the west border of Scotland and England, for a long time a cause of contention between the two countries and a refuge for outlaws.

Debay, Auguste Hyacinthe, French painter and sculptor: b. Nantes 20 April 1804; d. Paris 14 March 1865. He was a son of J. B. J. Debay the elder, and was a pupil of his father and of Gros. He took a medal of the third class 1819 at the age of 15, the second prize of Rome in 1822 with his painting 'Orestes and Pylades'; the first grand prize of Rome with his painting 'Ægisthus Discovering the Body of Clytemnestra,' and a first-class medal in 1831. From 1830 onward he exhibited in all the expositions at Paris, either as painter or sculptor. His principal pictures are: 'The Old Man and His Children'; 'Enlisting at the Place du Palais Royal'; 'The Meeting at the Field of the Cloth of Gold'; 'Attila'; 'Promenade of Sixtus Fifth'; and the 'Battle of Dreux'. As a sculptor he received honorable mention for his 'Napoleon I.' (1841); the first prize in open competition for the monument of Monsignor Affre, now at the Church of Notre Dame, Paris; and a first-class medal at the Exposition 1855 for his best-known work, 'Primitive Cradle'; first shown in 1845. Among other works are statues of Perrault and Claude Lorraine, at the new Louvre; and the marble mausoleum of the Comte and Comtesse de Damas.

Debay, Caroline Louise Emma, French painter: b. Paris 24 March 1809; d. there 6 Sept. 1832. She was a sister-in-law of A. H. Debay (q.v.). Among her works are: 'Christina of Sweden'; 'The Village Bride'; and the 'Young Girl Asleep'.

Debay, Jean Baptiste Joseph, French sculptor: b. Malines, Belgium, 10 Oct. 1779;



PANAMINT MOUNTAINS AND DEATH VALLEY.

d. Paris 14 June 1863. He was first a pupil of the painter Van Biscom, then went to Paris and studied under Chaudet. Summoned to Nantes, he made 30 busts for the library, 10 statues for the Exchange, the frontal of the Hotel de Ville, and the statues of Saints Peter, Paul, and John. Returning to Paris 1817, he made two colossal statues of Neptune and Apollo for Havana; and took a second-class medal with a bust of Talma. Among his works are: a bronze equestrian statute of Louis XIV. at Montpellier; statue of the 'Chancellor of the Hospital,' at Aigueperse; marble statute of 'Mercury putting Argus to Sleep' and 'Mercury Preparing to Slay Argus' at Havana; group of the 'Three Fates'; marble statue of Charles Martel, in the museum at Versailles; marble statue of Colbert; 'Young Woman and Shells,' considered his best work; and the figures of 'Ocean' and 'The Mediterranean' for one of the Place de la Concorde fountains. During his later years he held the position of restorer of sculptures at the Louvre. He received the decoration of the Legion of Honor 1825. He executed numerous portrait-busts in excellent style.

Debay, Jean Baptiste Joseph, French sculptor: b. Nantes 31 Aug. 1802; d. Paris 7 Jan. 1862. He was the eldest son of the preceding. He was a pupil of his father and of Bosio, and went to Havana at 17 years of age to deliver his father's statues. He took the second prize of Rome 1823, with a bas-relief, 'The Grief of Evander,' and in 1829 the first grand prize of Rome with the 'Death of Hyacinth.' He received the decoration of the Legion of Honor in 1851. Among his works are: 'Theseus'; 'Genius of the Sea'; 'Genius of the Hunt'; 'Young Slave,' first-class medal 1836; 'Anne de Bretagne,' Luxembourg Garden; a bronze statue of 'Cambronne' at Nantes; 'Marshal Oudinot' at Bar-le-Duc; 'Modesty and Love,' marble group; equestrian statue of Napoleon III., at Bordeaux; 'Six Apostles,' church of St. Eustache, Paris; and 10 statues for the Pommeraie Gallery at Nantes.

Debenture, in finance, a certificate or document signed by a legally authorized officer, as an acknowledgment of a debt due to some person; a deed or bond of mortgage on certain property for the repayment to a certain person of a certain sum of money advanced by such person, together with interest thereon at a certain stated rate. Debentures are frequently issued by public companies, especially railroad companies, for the purpose of raising money for the completion or carrying on of their undertakings.

In customs, a certificate entitling the person to whom it is granted to a drawback on certain goods exported, the duties on which had been paid.

In public offices, in some government departments, a term used to denote a bond or bill by which the government is charged to pay a creditor or his assigns the money due on auditing his account.

Deboe, William J., American lawyer: b. Crittenden County, Ky., 1840. He was graduated at Ewing College, Illinois, and at the Medical Department of the University of Louisville; practised medicine for a number of years; was admitted to the bar, and practised in Marion, Ky. He was a delegate to the Republican National Convention which met in Chicago and nominated Benjamin Harrison for the presidency in 1888, and was elected superintendent of the schools of Crittenden County in 1890. He was a member of the State senate 1893-6, and was elected to the United States Senate in 1897-1903.

Deb'orah, Hebrew seer or prophetess. She lived in the time of the Judges, and by the aid of Barak delivered the northern tribes from the oppression of Jabin, and secured a peace of 40 years' duration. The triumphal ode (Judges v.) attributed to her is a remarkable specimen of Hebrew poetry.

De Bow, James Dunwoody Brownson, American journalist and statistician: b. Charleston, S. C., 10 July 1820; d. Elizabeth, N. J., 27 Feb. 1867. He studied law, was admitted to the Charleston bar in 1844 became a contributor to the 'Southern Quarterly Review,' published at Charleston, and in 1844 took charge of that periodical as chief editor. Among other papers prepared by him for its pages was an elaborate article, published in 1845 upon 'Oregon and the Oregon Question,' which attracted much attention both in this country and Europe. It was translated into French, and was the occasion of a debate in the French chamber of deputies. In 1845 he removed to New Orleans, and established 'De Bow's Commercial Review.' This enterprise proved successful, and the work attained a circulation greater than has ever been reached by any similar publication in the South. In March 1853 he was appointed superintendent of the United States census. In that position he collected and prepared for the press a large part of the material for the quarto edition of the census of 1850. He afterward compiled the volume entitled 'Statistical View of the United States,' a compendium of the 7th census. In 1853 he compiled from his review a work published under the title of 'Industrial Resources of the Southwest.'

Debraux, Paul Emile, pōl ā-mēl de-brō, French balladist: b. Ancerville, department Meuse, 30 Aug. 1796; d. Paris 12 Feb. 1831. He was an ardent Republican, and wrote for the common people lively songs of wine and love, sung everywhere in tavern and workshop. He was called "the Béranger of the rabble." His best-known songs are: 'Mt. St. John'; 'Belisarius'; 'Say, Do You Remember?'; 'The Soldier's Widow'; 'Marengo.' Béranger published a complete collection of his 'Songs.'

Debreczin, dā-brĕt'sĭn, Hungary, a town on the edge of the great central plain of Hungary, about 113 miles east of Budapest. Its houses are mostly of a single story; and in wet weather the wide but unpaved streets become almost impassable from mud. The principal edifices are the Protestant church, and the Protestant college, with a library of 100,000 volumes, Roman Catholic church, town-house, Piarist college, gymnasium, several hospitals, etc. Both the manufactures and trade are important; the former consisting chiefly of coarse woolens, leather, soap, tobacco-pipes, casks, etc., and the latter being in tobacco, wine, flax, hides, wool, potash, cattle, cheese, etc. There are four large fairs annually, and the swine market is the largest in the kingdom. Debreczin is considered the headquarters of Hungarian Protestantism. The Protestant college, founded in 1792, is

considered the best educational establishment in Hungary. The town suffered much in the wars between the Hungarians and the Turks, and afterward in the religious wars. Pop. (1900) 75,167.

De Bry, de-brē', **Theodor,** Flemish goldsmith and copperplate engraver; b. Liege 1528; d. Frankfort-on-the-Main, Germany, 1598. He settled in Frankfort-on-the-Main about 1570, and established a printing house there. The most important of the works issued from his press is the collection of 'Voyages to the East and West Indies,' published in Latin (25 parts, 1590–1634) and German (27 parts 1590–1630).

Debs, Eugene Victor, American socialist, b. Terre Haute, Ind., 5 Nov. 1855. He received a common school education and became a locomotive fireman. He was elected to the Indiana legislature in 1885 and was later an official of the Brotherhood of Locomotive Firemen, and, from 1893 to 1897, president of the American Railway Union. He conducted the strike of 1893 in Chicago, and was later sent to jail for contempt, because of his management of the same, though he pleaded innocence of any crime and requested to be tried by a jury and be allowed to summon witnesses in his defence. Since 1897 he has been prominent in the Socialist movement, and in 1900 and 1904 was the candidate of the Social Democratic party for President of the United States.

Debt, National, the amount which a State admits owing to those who have advanced money for the use of the government on occasions when its expediture has exceeded its income. The amount of a national debt may not be the amount which the nation has borrowed; it is often greater, from the necessity of holding out inducements to capitalists, and also for the increment of interest. When money is bearing low interest, a nation may give its creditors the alternative of receiving payment or allowing a deduction from the nominal amount of their debt. The following table shows the public debts of the nations of the world at the end of the century:

Countries	Debt	
	Total	Per Capita
Gold Standard	Dollars	Dollars
Austria-Hungary	2,821,706,000	68.22
Belgium	506,853,000	76.95
British Africa	185,189,000	37.55
British Australia	1,110,465,000	231.64
British Honduras	169,000	4.97
British North America	72,017,000	14.49
British West Indies	20,459,000	13.63
Bulgaria	50,612,000	15.28
Costa Rica	11,125,000	37.71
Cuba	341,726,000	209.39
Denmark	56,287,000	25.76
Dutch East Indies		
Egypt	481,359,000	49.45
France	5,829,742,000	151.12
Germany	2,573,585,000	60.00
Great Britain	3,099,427,000	76.89
Hawaii	4,489,000	41.18
India and Ceylon	1,200,418,000	4.13
Japan	201,110,000	4.71
Netherlands	470,528,000	94.03
Peru	23,798,000	9.08
Rumania	249,305,000	42.98
Russia	3,837,156,000	35.29
Servia	72,075,000	31.13
South African Republic	13,278,000	12.12
Sweden and Norway	125,688,000	17.92
Switzerland	16,428,000	5.33
Uruguay	128,850,000	155.62
United States	2,104,875,000	28.06
Argentine	445,000,000	112.52
Brazil	506,400,000	39.51
Chile	141,670,000	39.00
Greece	157,563,000	13.80
Haiti	23,756,000	24.74
Italy	2,388,662,000	75.43
Portugal	622,895,000	123.34
Spain	1,742,857,000	99.22
Turkey	726,011,000	32.22
Venezuela	37,058,000	15.41
Total gold standard countries	32,433,093,000	34.88
Silver Standard		
China	200,000,000	.49
Guatemala	16,734,000	10.90
Honduras	32,430,000	81.08
Hongkong	1,709,000	5.31
Mexico	83,500,000	6.62
Nicaragua	3,000,000	7.14
Persia	11,588,000	1.29
Salvador	37,605,000	40.77
Straits Settlements		
On a paper basis		
Bolivia	4,153,000	2.06
Colombia	18,361,000	4.59
Ecuador	12,500,000	9.83
Paraguay	42,941,000	7.01
Total silver standard countries	463,621,000	1.03
Grand total	32,896,714,000	35.91

Debtor and Creditor, Laws of. One of the earliest institutions among men is the right of holding individual property. Upon this right depends the power of making bargains and effecting exchanges. In various ways bargain-making gives rise to deferred engagements, and obligations are incurred which are called debts. These obligations rest upon a double foundation. The right of holding individual property implies the right of recovering any property which has been intrusted to others, or of claiming possession of any property which others have, for a valuable consideration, agreed to make over to us. The primary foundation of debts, therefore, is the right of holding property. A debt is a contract freely entered into. Whether the right of property is valid or not, it is commonly recognized by the person who incurs debt; no abstract doctrine of the rights of property, therefore, can properly come between him and his creditor to justify the violation of an engagement for which he has accepted an equivalent. Credit affords a means by which those who have no property of their own may acquire important advantages through the use of the property of others, and while proprietary rights are recognized, it is of great consequence to society that the obligations incurred in borrowing should be faithfully fulfilled. Hence a very great practical importance is to be attached to the moral obligation implied in the contract of a debt, independently altogether of any abstract or theoretical views which may prevail as to the soundness of the particular institution of proprietary rights on which that obligation may be founded.

In early and rude states of society the natural tendency is to regard all obligations as sacred and inviolable, and all who from any cause fail to fulfil them as criminal in act or intention, either by omission or commission, and liable to

the most severe and exhaustive punitive treatment. In such a state of society both the primary and secondary foundations of the obligation are likely to be held in extreme estimation. Hence in the earlier stages of society the laws against debtors are universally found to be of the most stringent kind, and as civilization advances, and the relations of society become more complicated, the necessity of repeated modifications of these severe laws becomes apparent. Any modification in favor of the debtor of the consequences of incurring debt, however equitable in itself, necessarily tends to increase the facility with which debt will be incurred, and if these consequences are over-relaxed society will be deprived of a needed protection; debt will be incurred carelessly, and as carelessness borders upon recklessness, and recklessness upon fraud, the lines of distinction between right and wrong dealing will become fainter, the protection due to misfortune, and the condonation necessary to be extended to miscalculation and errors of judgment will become a cover for deliberate conspiracy, and society will become a prey to an organized predatory system of modernized form of highway-robbery, thinly disguised under the forms of commerce. Such are the practical difficulties which the modern theory of the law of debtor and creditor has to encounter.

Among the Jews, under the Mosaic law, debt was treated with great stringency, but there were regulations adapted to discourage the incurring of it, and also some humane restrictions on the power of the creditor after it had been incurred. Lending on usury was forbidden, and the taking of pledges put under severe restriction. The alienation of the estate of an Israelite was also forbidden. The creditor, on the other hand, had power over the person of his debtor, and even over those of his wife and family, and could cause them to be sold in satisfaction of his claim. If the debtor was an alien he might be sold to perpetual bondage, but on the occasion of a jubilee, which was appointed to be proclaimed every 50th year, every Israelitish debtor was set free, and his property, if pledged or sold, returned to him.

Nothing is more common in rude states of society, and under arbitrary and despotic governments, than the liability of the person of the debtor for his debt. This is one of the original sources of slavery. Even in the comparatively enlightened states of Greece and Rome the power of the creditor over the person of his debtor was recognized by law. This power was abolished in Athens by Solon, who is said to have taken his reform from Egypt, where the same unjust law had already run its course. The early Roman law was even more excessive in its undiscriminating severity. By the law of the Twelve Tables the creditors might cut the body of the debtor in pieces and share it among them, they might also sell him and his wife and family to perpetual slavery. In the Middle Ages, notwithstanding the influence of Christianity, the debtor was treated with hardly less severity. Even the Church took the side of the creditor, and the debtor who died without discharge was excommunicated and deprived of Christian burial. As society became more refined the laws against debtors were again gradually ameliorated, but the process was a slow one. Imprisonment for debt in England, except as an instrument for compelling the surrender of the debtors' effects, was only put an end to in the reign of Victoria.

In the United States originally imprisonment of debtors was adopted as a part of the common law, but at the present time imprisonment for debt, except in case of fraud, or of an absconding debtor, does not legally exist in any of the States. Congress, empowered by the United States Constitution to make a uniform bankrupt law, exercised this power, and subsequently repealed the law of imprisonment; and now, by Revised Statutes 990 and 991, no person can be imprisoned for debt by any process issuing out of the courts of the United States, in any State where by the laws of the State imprisonment for debt has been abolished. Most of the States, by constitutional provision, have prohibited arrest or imprisonment for debt, while the other States, either by direct statutes prohibiting imprisonment for debt, or by poor debtors laws, or by insolvent laws, secure the same result; it being held to be against public policy to deprive a man, by imprisonment, of the power to pay his debts, and make him a direct charge upon the State.

Debts, United States Public. These consist of the debts contracted by the nation, the States, and municipalities.

National.— The nation has contracted eight principal debts in its existence, which have overlapped each other and been complicated with incidental loans for special purposes. Five of these were for wars,— that of Independence, the War of 1812, the Mexican war, the Civil War, and the Spanish-American war; the present national debt is mainly for the Civil War. The other three were due to the commercial panics of 1837 and 1857, and the imminent silver bankruptcy of 1893.

At the close of the Revolution, the United States owed to foreigners $10,313,505.91,— $6,352,000 for French government loans, $3,600,000 for Dutch loans, $174,017.13 for Spanish bankers' private loans, and $186,988.78 for 6 per cent certificates of indebtedness to French officers who had served in the Revolution. The domestic debt was upward of $35,000,000; including some $600,000 for funding of about $6,000,000 Continental paper money at a cent on the dollar, and about $2,000,000 in Continental bills of credit. Besides these, the States owed debts which, when they were taken over by the national government under the Constitution, 4 March 1789, were arbitrarily estimated at $21,500,000, and actually assumed at $18,271,786.47. At this time, the principal and arrears of interest on the foreign debt were $11,710,378.62; of domestic debt, $40,414,085.94 (nearly a third of it unpaid interest); making, with the bills of credit and the State debts, an aggregate officially stated in 1791 as $75,463,476, at four and five per cent interest, and thus creating a total interest charge of $4,587,444.81. This aggregate fluctuated around $80,000,000 for many years, the new navy, the Barbary wars, and the Indian wars, etc., preventing much reduction. It reached a maximum of $86,427,120 in 1804, as a result of borrowing part of the $15,000,000 for the Louisiana Purchase. From thence to 1812 it was steadily paid off by an average installment of $5,000,000 a year, till it had dropped to $45,209,737. Then the war with England

intervened and the debt was not finally closed out till 1834.

The War of 1812 cost $80,500,073.50 in loans which yielded only some $34,000,000, owing to the country's poor credit; and the debt in 1816 stood at $127,334,933. Thenceforward till 1834 it was paid off by a sinking fund and redemptions, with only one interruption: in 1821 $5,000,000 was borrowed to pay the award under the Florida treaty, and the debt rose $3,500,000, to $93,540,. In 1830 it was $48,565,406; in 1832, $24,322,.. 5; in 1833, $7,001,698; in 1834, $4,760,082; and the next two years saw only $37,513 on the books, not at once redeemable. This extinction left some $40,000,000 surplus in the treasury, of which $37,468,819.97 was deposited unsecured in State banks. The consequent inflation and wild-cat banking, with Jackson's fluctuating and reckless financial methods, caused a crash and panic in 1837, and the fourth quarter's installment could not be, and never has been, repaid. The government had to borrow more money, and after this was paid new government enterprises were undertaken. From $3,308,124 in 1838, the debt grew to $23,461,652 in 1844, with a temporary increase of $12,000,000 the year before; the next year $7,500,000 were cleared off, and in 1846 the balance due stood at $15,550,202. Then came the Mexican war; its cost, and the money paid for cessions of territory, raised the debt to $63,001,858 in 1849, and to $68,304,790 in 1851. Payments on the principal now began again, and in 1857 had reduced it to $28,699,831. The panic of that year and the commercial depression thenceforward again forced a resort to borrowing,—$20,000,000 at five per cent 1858, $21,000,000 six per cents in 1860. This indebtedness was shortly afterward increased by the War loan. By 1860 the debt stood at $64,842,287.

The history of the debt through the Civil War is a financial record which it is difficult to keep separate from a general history of currency, so many devices were utilized in the way of paper money, from postage stamps to interest-bearing bonds circulating as cash. The first loan was negotiated in February 1861, before the actual outbreak of the War. Of $25,000,000 authorized, only $18,415,000 worth of bonds were issued, at six per cent for 20 years; and even these could not command par. On 2 March $35,394,450 in two-year six per cent treasury notes, receivable for customs, were issued. On 17 July 1861 the first great loan was authorized with full sense of the magnitude of the task before us: $250,000,000 20-year seven per cents; the Treasury having authority to issue any part of it in three-year 7.30 per cent treasury notes (the "seven-thirties"), or in demand notes without interest not to exceed $50,000,000, or in one-year 3.65 per cents. On 5 Aug 1861 an issue of six per cent 20-year bonds was authorized in exchange for the one- and three-year bonds, and the demand notes made receivable for all government dues; this brought the latter from a condition of unsalability to the command of a premium, and the former were readily bought in exchange for the short-term notes. The issue of 7.30's reached $140,011,750, the 3.65's sold largely, and the entire $50,000,000 of demand notes were taken while the 20 year six per cents had an issue of $189,321,200. On 12 Feb 1862, $10,000,000 more demand notes were issued. In that month also the first of the great popular loans was put on the market, the famous "five-twenties" (redeemable after 5, and payable after 20 years). They were six per cents, and the $500,000,000 authorized was issued in full. Fifteen million dollars more were issued 1864–5. On the 25th of the same month, the first issue of "greenbacks" to the amount of $150,000,000 was made, on 11 July another of equal amount appeared, and on 3 March 1863 still another,—$450,000,000 in all. Of these, $400,000,000 were made permanent, but contractions in 1868 and 1869 reduced their volume to $340,681,016. Several acts, one of this same financially memorable February 1862, authorized the receipt of deposits at five per cent, and the amount was fixed at $100,000,000 on 11 July; on 30 June 1864 another $50,000,000 was authorized, at six per cent. These were all redeemable at 10 days' notice, and redeemed in 1865 and 1866. The success of these loans in 1861–2 had been marvelous; but their magnitude had strained the public credit and resources, and various other means were adopted. In March 1862 one-year six per cent certificates of indebtedness to public creditors were authorized, and $561,753,241 were issued, all redeemed by 1866. In March 1863 the first fractional currency was authorized, postage stamps having been hitherto used as such; a $900,000,000 gold loan was authorized, but only $75,000,000 was issued; and $400,000,000 more in treasury notes for one, two, and three years, of which $477,595,400 was issued; namely in one-year five per cents, $44,520,000; in two-year five per cents, $166,480,000; in three-year six per cents, $266,595,440. These notes were canceled or exchanged by 15 May 1868. In March 1864 the "ten-forties of 1864" were authorized: $200,000,000 of five or six per cent gold bonds, redeemable in 10 and payable in 40 years. Of these, $166,117,300 were issued at five per cent, and $3,882,500 at six per cent. In June 1864 the issue of the "five-twenties of 1864," six per cents, was authorized up to $400,000,000, but bearing bonds circulating as cash. The first loan was negotiated in February 1861, before the actual outbreak of the War. Of $25,000,000 in all, $829,992,500 of 7.30's was issued; all were redeemed by July 1868. After this, several large loans in six per cent five-twenties were made, and loan certificates of deposit were issued; but as they were intended exclusively to redeem treasury or compound-interest notes, and did not increase the public debt, they belong to a history of government finance, not of the debt. In July 1870 a refunding act was passed, to enable the government obligations at high interest to be replaced by others at lower rates.

The amount of the national debt in 1862 was $524,176,412; in 1863, $1,119,772,130; in 1864, $1,815,784,370; in 1865, $2,680,647,870; in 1866, $2,773,236,174. This was the climax; thenceforward with interruptions only during the long depression of 1873–8, it steadily declined, till 1893. In 1881 it was $2,053,353,961; in 1893, $1,545,996,591. At this time the threatened bankruptcy of the Treasury, owing to the enormous accumulations of silver under the Sherman Act, compelled a fresh issue of bonds to preserve the national credit, by increasing the gold reserve. These were five per cents; in 1898 an issue of three per cents was made for the Spanish War. In 1902, exclusive of $860,316,569 of certificates and treasury notes offset by an equal amount of cash in the Treasury, the debt was

$1,314,929,599.89; in all $2,175,246,168.89. Of this, the interest-bearing debt was $915,370,230, and the interest charge about $30,000,000, as against $151,000,000 in 1865. Of course, not only has the principal of the debt declined, but the interest rates even more: government three per cents command a heavy premium, and by the act of 14 March 1900 the bonds of all rates were made convertible into two per cents.

State.—The latest returns of State bonded debts show a grand total of $177,559,948. After the assumption of their debts by the national government, the States incurred none of moment till they contracted small loans to assist the government in the War of 1812. They did not attempt any considerable loans for internal improvements till about 1820, but in the next five years had aggregate debts of $12,790,728. In 1830 the total had increased to $26,470,417, in 1835 during the great western "boom," it had risen to $66,583,186; and in the frantic speculation of the three years, 1835-8, $107,823,808 were added to it. By 1840 it was over $200,000,000. But the improvements in western lands thus effected, though in the main good and useful, and some of them since profitable, had far outrun the immediate ability of the property developed to pay for them: several States defaulted principal or interest, or both, and as the Constitution had forbidden States to be sued in the courts, the foreign bondholders were without recourse when they repudiated their obligations. The chief offenders were Pennsylvania, Maryland, Michigan, Indiana, Illinois, Mississippi, and Louisiana. America was an unsavory name in foreign parts, and none the less so that some of the State leaders attempted justifications which the creditors thought impudent dishonesty. From 1840 on, a strong effort was made to have the general government assume the debts once more; in December 1842 a select committtee of Congress was appointed to report, which it did the following March; the total amount then was $207,894,613.35, and the interest charge $10,394,730.64. There were too many obstacles, and the plan fell through: the solvent and prudent States were not inclined to saddle themselves every few years with the obligations of those not so. As a fact, however, the States have not since abused their opportunities. The only cases of repudiation since have been among the Southern States plundered by the "carpet-bag" governments, and saddled with debts at once fraudulent and impossible of payment; though one or two have taken advantage of this plea to repudiate debts not owing to the carpet-bag régime and not difficult of payment. In 1880 the combined State debts amounted to $250,722,081; so that they have been reduced by nearly one fourth within a generation, although not wholly by being paid. Nearly every State in the Union now has constitutional prohibitions from borrowing over a certain amount or percentage for public purposes.

Municipal.—The total debts of the 100 largest cities of the United States foot up about $845,000,000; of which New York has considerably over one third, namely $311,829,916. More than $100,000,000 more is held by two others, Boston ($51,860,954) and Philadelphia ($50,055,395), the three together carrying nearly half the entire municipal debt of the country. None others have even half so much as either of the two latter: and singularly, the fourth in the list, Cincinnati is only tenth in nominal, though higher in actual population. She has $27,081,254; while Chicago, the second in population, has $23,719,000. Cleveland, St. Louis, Baltimore, New Orleans, Buffalo, and Jersey City, in order, with $18,000,000 to $16,000,000, have together about $103,000,000. These 11 cities have in all about $568,000,000, or two thirds of the entire United States municipal debt. Washington, Newark, and Pittsburg are the only others which have over $10,000,000. It must be remembered that there are sinking funds which heavily reduce this total; and that most of it has been contracted for conveniences or beauties which attract population and so reduce taxes. More than one fifth of the whole, indeed, is for water-works, which are not in any proper sense debts at all, as the water is paid for directly. The water-works systems of the country represent probably close on $200,000,000 of investment. About six per cent is for parks and public places, nearly as much for bridges and harbor improvements, about 10 per cent for railroad aid, and nearly four per cent for public buildings. A great number of municipalities also are forbidden by law to incur above a certain fixed or contingent amount of debt.

Début, dā-bū', a French word which has been adopted into the English language, signifying generally a beginning or entrance, but specially applied to the first appearance of an actor or actress on the stage, or to a first appearance in a particular theatre. In these circumstances, the actor is called a *débutant;* the actress, a *débutante.* The expression is very frequently used with reference to a young lady's first entrance into society.

Deca (Gr. signifying "ten"), a prefix of frequent occurrence; as in *Decapolis,* a group of 10 cities; *decalogue,* the 10 commandments; *decametre,* a measure of 10 metres, etc. From *deca* is formed *decade,* a collection or group of 10. In the calendar of the French Republic the term decade was used to designate the week of 10 days, which were severally named *primidi, duodi, tridi, quartidi, quintidi, sextidi, septidi, octidi, nonidi,* and *decadi.* See CALENDAR.

Decachord, dĕk'a-kôrd (Gr. *dekachordas,* ten-stringed), an ancient Greek instrument of 10 strings, triangular in shape; also a kind of large guitar with 10 strings.

Decade (Latin, *decas,* from the Greek *deca*), a group or division of 10, especially a period of 10 years, a decennium. The books of Livy are divided into decades. In the French Revolution, decades, each consisting of 10 days, took the place of weeks in the division of the year. See CALENDAR.

De'cadents, The, a school of artists and writers, the followers of which delight in the more or less morbid refinements of feeling and style, and pride themselves upon this perversion of taste. The decadent is fond of the products of declining civilization corrupted by many centuries of culture, of works too highly seasoned and vitiated, which presage the final dissolution of a social order fallen into decrepitude, and shuns the simple, the natural, the healthful, clinging only to the artificial and the complicated in life and character. The name of decadents may rightly be given to those who make a subtile virtuosity out of art. Among French writers

Baudelaire was the first theorist of this school, and his influence was felt by many writers of the "end of the century," such as the Goncourts and Maurice Barrès. The decadents' school of poetry is best represented by Stephane Mallarmé and Verlaine, and its disciples are numerous, including many men of undoubted talent who have combatted the stiffness and dryness of the Parnassians, not without success. They are often termed déliquescents and symbolists; the latter term is well chosen as indicating their aims and manner.

Decalogue, the Ten Commandments, called by the Hebrews Ten Words, of which Decalogue (*ot deka logoi*) is a literal rendering. In all versions of these Ten Words whether as taken from Exodus xx. or from Deuteronomy v., there is essential verbal agreement; but the precepts are differently distributed by the Latin Church and the Lutheran on one hand, and the Greek Church and the Reformed on the other; and the Church of England stands with the Reformed, or the churches of Calvinian descent. What in the Roman Catholic and the Lutheran arrangement of the Decalogue is the first commandment is in the arrangement adapted by those other bodies the first and second; and what in the Roman Catholic and Lutheran arrangement is the ninth and tenth is for the others the tenth. In this distribution of the matter of the Decalogue some Protestant controversialists descry an endeavor on the part of the Roman Church to evade the prohibition of image-worship, in particular, because in a necessarily succinct popular formula of the first commandment no mention is made of images: "I am the Lord thy God: thou shalt not have strange gods before me." But it is replied that the inculpated division and distribution of the matter of the Decalogue is not peculiar to the Roman Church, for in the Talmud, the Targum of Jonathan, and in the writings of many rabbinical commentators the prohibition of worship of strange gods and the prohibition of worship of images are classed as one commandment, or one "word," the second, for they regard the proœmium, "I am the Lord thy God, etc.," as the first "word" but they comprise in the tenth commandment the prohibitions of the 9th and 10th of the Roman Catholic scheme. The Lutheran scheme is in accord with that of the Latin Church, save that it follows the order of the prohibitions of covetousness given in Deuteronomy, not that in Exodus, which is the order followed by the Latin Church.

Decameron, dē-kăm'ē-rŏn, anything of 10 days' occurrence; also the title given to a collection of tales by Boccaccio, written in 10 parts, each part containing 10 stories, and being supposed to occupy one day in the narration. Boccaccio represents the stories as being told by seven ladies and three gentlemen, who had fled from Florence into the country to escape the fearful plague of 1348, and who had no other means of passing the time.

De Camp, John C., American naval officer: b. New Jersey 5 Oct 1812; d. Burlington, N J., 24 June 1875. He entered the navy in 1827; served in the frigate Constitution off the coast of Africa in 1854, and received the rank of commander the next year. During the Civil War he had command of the steam sloop Iroquois in the attack on Fort Jackson and Fort Philip, and served on the Mississippi under Farragut, distinguishing himself especially at Vicksburg. In 1868–9 he commanded the receiving ship Potomac, and was retired in 1870.

Decamp', **Joseph Rodefer**, American landscape and figure painter: b. Cincinnati 5 Nov. 1858. He was a pupil of Frank Duvenant in Munich and became a member of the American Society of Artists. His landscapes, though generally realistic in treatment, show the influence of impressionistic methods.

Decamps, Alexandre Gabriel, ā-lĕks-āndr gä-brē-el dē-kañ, French painter: b. Paris March 1803; d. Fontainebleau 23 Aug. 1860. He was educated in the studio of Abel de Pujol. When a young man he made a journey to the East, and returned from thence with a collection of sketches, from which he afterward produced some of his finest pictures. Among the more celebrated of these are: 'The Grand Bazaar'; 'Relieving Guard at Smyrna'; 'A Turkish Café'; 'Turkish Children Going Out of School'; and 'Arab Horsemen Passing a Ford.' Of pictures of another class are: 'The Shepherd and His Flock Overtaken by a Storm'; 'An Italian Village'; 'The Hawking Party'; 'Spaniards Playing at Cards'; 'Don Quixote and Sancho Panza.' Decamps also produced some historical and sacred pictures of a high order of art, including the 'Defeat of the Cimbri'; 'The Miraculous Draught of Fishes'; 'Joseph Sold by His Brethren'; 'The Finding of Moses'; and others. The leading merits of this painter are great originality of conception and vigor of expression, with a wonderful skill in the treatment of light and shade.

De Candolle, Alphonse Louis Pierre Pyrame, āl-fōńs loo-ē pē ār pē-rām dē kāń-dōl, Swiss botanist: b. Paris 28 Oct. 1806; d. Geneva 4 April 1893. He was a son of Augustin De Candolle (q.v.) and also published several works of note, the most important being: 'Geographical Botany' (1855) and 'Origin of Cultivated Plants' (1883). He also edited the 'Memoirs' of his father (1862).

De Candolle, Augustin Pyrame, Swiss botanist: b. Geneva 4 Feb. 1778; d. there 9 Sept. 1841. He studied chemistry, physics, and botany in Paris, where in 1797 his earliest work, on lichens, was published. Other works quickly followed, including his 'Astragalogia' (1802) and his valuable 'Essays on the Medicinal Properties of Plants' (1804). In 1802 he was elected to an honorary professorship in the Academy of Geneva, but remained in Paris, and delivered his first botanical lectures in the Collège de France in 1804. His 'French Flora' appeared in four volumes in 1805. Employed by the government, he visited all parts of France and Italy in 1806–12, investigating their botany and agriculture. The results of his journeys are partly embodied in a supplement to the 'Flore.' He was appointed in 1807 to a chair at Montpellier, where he lived from 1810 to 1816; he then retired to Geneva, where a professorship of botany was founded for him, and where he spent the remainder of his life. De Candolle was an industrious writer, and the fruits of his studies in systematic botany and the properties and natural affinities of plants are embodied in a considerable number of works. The greatest of

these, his 'Natural System of the Vegetable Kingdom' (Vols. I. and II. 1818–21), was commenced on too grand a scale, and was continued within more reasonable limits in the 'Preliminary View of the Natural System of the Vegetable Kingdom' (17 vols. 1824–73, the last 10 by his son and others).

Decapoda, an order of malacostracous *crustacea* (q.v.), in which the fourth to the eighth pairs inclusive of the thoracic appendages form uniramous walking limbs; the head and thorax are united to form a cephalothorax, and the eyes are stalked. Two sub-orders are usually recognized: (1) The *Macrura,* in which the abdomen is not permanently flexed beneath the thorax, but forms a long, powerful swimming organ terminated by a so-called caudal fin; (2) the *Brachyura,* having the abdomen much reduced in size and permanently flexed beneath the thorax, which is usually shorter than wide, while the antennæ and antennules are much reduced in size. See CRAB; LOBSTER; SQUID; CEPHALOPODA. The crab is typical of this group.

Deca'tur, Stephen, American commodore: b. Newport, R. I., 1751; d. Philadelphia 14 Nov. 1808. During the war of the American Revolution he commanded several privateers, and acquired some reputation by the capture of English ships. At the commencement of hostilities with France in 1798, he was appointed to the command of the Delaware of 20 guns, in which ship he cruised during the years 1798–9 on the American coast, and in the West Indies, capturing at different times the French privateers Le Croyable of 14, and Marsuin of 10 guns. In 1800 he commanded a squadron of 13 sail on the Guadeloupe station, the Philadelphia, a frigate of 38 guns, being his flagship.

Decatur, Stephen, American commodore: b. Sinepuxent, Md., 5 Jan. 1779; mortally wounded in a duel near Bladensburg, Md., 22 March 1820; d. at Washington, D. C., the same day. He was the most conspicuous figure in the naval history of the United States for the 100 years between Paul Jones and Farragut. Contrary to the general opinion Decatur's family originated in Holland, where the name De Kater is of great antiquity. A scion emigrated from Amsterdam to Bordeaux early in the 17th century. He married a French woman of some rank and one of their descendants, a merchant ship owner, was ennobled by Louis XV. in 1733. From him sprang Étienne Decatur, reputed a lieutenant in the French navy. He came to Newport before the middle of the 18th century, married Priscilla Hill in 1751, and died in 1753, leaving one son, Stephen Decatur (q.v.), the father of the commodore. This Decatur married Anna Pine, an Irish woman. Of them was born the great commodore. He was well educated at the Episcopal Academy and at the University of Pennsylvania. Refusing a clerical life, in 1796 he entered the counting house of a firm of ship owners. In 1797 he got out the keel pieces of the frigate United States and was on her when she was launched, the first ship of the United States navy. Through the instrumentality of Commodore John Barry he was appointed a midshipman in the navy by President Adams, 30 April 1798. He cruised in the West Indies during the French war in the United States, taking part in various minor naval actions. Such was his aptitude and ability that he was commissioned lieutenant, 3 June 1799.

At the outbreak of the Tripolitan war, in command of the schooner Enterprise, he captured the bomb ketch Mastico, 23 Dec. 1803. In this ketch, renamed the Intrepid, he destroyed the frigate Philadelphia in the harbor of Tripoli. The Philadelphia had been chasing hard inshore and had run upon a reef. She had been surrounded and captured by the Tripolitans, who had floated her and towed her into the harbor. The naval force of the United States in the Mediterranean was small. So soon as the Philadelphia could be refitted the preponderance would be with the Tripolitans. It was necessary to destroy her. Decatur volunteered. He boldly entered the harbor in the Intrepid, succeeded by strategy in getting alongside the Philadelphia undiscovered. The frigate was carried by boarding. Her crew were killed or driven overboard. The Americans set fire to her and made their escape under a furious bombardment from the shipping and batteries. Decatur did not lose a man. There is no authority for the statement that Lord Nelson pronounced this "the most bold and daring act of the age," but the phrase accurately described the undertaking.

On 3 Aug. 1804 Decatur commanded the American gunboats in their attack upon the Tripolitan flotilla. He captured two gunboats by the most desperate hand-to-hand fighting in a battle which has been called the "biggest little fight in history," and well merits the name. He took part in four other attacks on Tripoli with his usual distinction. For the burning of the Philadelphia he was commissioned a captain, and at the age of 25 was placed in command of the frigate Constitution. At the close of the war he returned home, having divided with Commodore Preble the honors of the campaign.

On 8 March 1806 he married Miss Susan Wheeler of Norfolk, Va. He had no children, and his wife survived him many years. At the outbreak of the War of 1812 he was in command of the United States, 44, in whose building he had assisted, on which he had been launched, and in which he had made his first cruise. On 25 Oct. 1812 the United States captured the British frigate Macedonian, 38, Capt. John Surman Carden. The Macedonian was dismasted and almost cut to pieces. She lost 35 per cent of her complement, or 89 killed or mortally wounded, and 15 severely wounded, besides many others slightly wounded. On the American ship 7 were killed or mortally wounded, and 5 severely wounded. The United States was practically intact. The weather remained favorable and by strenuous work for two weeks the Macedonian was patched up and brought back to New York, the only trophy of the great frigate actions of the war that remained afloat. The disparity in force in favor of the United States was about 7 to 5, in damage inflicted about 9 to 1.

After being blockaded in New London for a year Decatur took command of the frigate President, 44. On the night of 14 Jan. 1815, in the midst of a howling gale, the blockaders having been dispersed by the storm, he put to sea from New York. Through an error on the part of the pilot, caused by the misplacing of

boys, the President ran upon a shoal and almost broke her back. Before she was got off the straining seriously impaired her sailing qualities. Decatur would have returned to the harbor but the gale prevented. On the morning of the 15th, off the eastern end of Long Island, he fell in with a British squadron of five heavy ships. Every effort was made to escape, but in the afternoon the President was brought to by the frigate Endymion, 44, which had been built especially to cope with ships of her class. A running fight ensued until 6 o'clock, when Decatur attempted to lay the Endymion aboard, hoping to capture her, scuttle the President and escape on the British ship, but the Endymion had the heels of the President and avoided the maneuver. For two hours the vessels sailed side by side in furious conflict. At the end of this time the Endymion was entirely silenced. She had been fought to a standstill. Decatur could not take possession for fear of the other ships. He tried running again, but the President had been severely injured in the battle, and about 11 o'clock she was overhauled by two British frigates, which ran alongside and opened fire. The British flagship was also in range and the last ship was coming up rapidly. The President had lost 24 killed and 55 wounded, including most of her deck officers. Decatur himself had been twice wounded. Further conflict with two fresh ships was hopeless. Decatur reluctantly struck his flag and surrendered to the commodore of the squadron. He was court-martialed for the loss of his ship, and acquitted of any misconduct in words of the highest commendation.

After the close of the war he was placed in command of a squadron and sent to the Barbary States to exact reparation for injuries and to enforce treaties of peace. His squadron captured the Algerine frigate Meshouda and the brig Estedio on 17 and 19 June. On 30 June 1815 he exacted submission and peace from the Dey of Algiers; on 20 July the same from the Bey of Tunis; and on 7 August the same from the Bashaw of Tripoli. The treaties were made at the mouth of the cannon and the indemnities demanded were paid immediately. Never has American diplomacy participated in more vigorous and successful negotiations.

In 1816 he was appointed naval commissioner and on 22 March 1820 he was killed in a duel with Commodore James Barron. The cause of this duel arose from certain strictures which Decatur passed on Barron. Barron had been suspended for his conduct on the Chesapeake when she was attacked by the Leopard in 1807. He had not returned to the United States during the War of 1812 but had remained in England, where he claimed to have been imprisoned for debt. When he applied for reinstatement after the close of the war Decatur opposed his request. He need not have entertained Barron's challenge save for a too nice sense of honor. He is buried in Saint Peter's church-yard, Philadelphia.

Loyalty to his country was the very breath of life to Decatur. Our judgment does not entirely approve the ethic significance of his famous sentiment, "My country — may she ever be right, but, right or wrong, my country"; but our affections tend to make the sentiment our own. There is a ring of sincerity in the words and in him which wins us in spite of all.

Consult Brady, 'Decatur'; Mackenzie, 'Decatur', 'Autobiography of Commodore Morris'; Allen, 'Navy and Barbary Corsairs'; various naval histories, etc.

CYRUS TOWNSEND BRADY.

Decatur, Ala., city, county-seat of Morgan County; on the Tennessee River and the Louisville & Nashville, and Memphis & Charleston railroads; 75 miles north of Birmingham. It has extensive manufactures of agricultural implements, engines, foundry products, lumber, sash and blinds, furniture, iron, flour, cotton, cottonseed oil, and leather. Pop. (1900) 3,114.

Decatur, Ga., town, county-seat of De Kalb County; on the Georgia Railroad; six miles east of Atlanta. Decatur was settled about 1822 and is governed by a mayor and a council of six members elected by popular vote. It is connected with Atlanta by two electric street railroads; and is the seat of the Agnes Scott Institute for young ladies, and the Donald Fraser School for boys. A battle was fought here 20 July 1864 between a portion of Sherman's army, under Gen. Thomas, and the Confederates under Gen. Hood, the latter retreating at nightfall. Pop. (1900) 1,418.

Decatur, Ill., city, county-seat of Macon County; near the Sangamon River, and on the Wabash, the Illinois Central, the Cincinnati, Hamilton & Dayton, and the Vandalia R.R.'s; 173 miles southwest of Chicago and 38 miles east of Springfield. It was settled in 1830 and in 1836 was incorporated. Decatur is in the midst of the famous Illinois corn belt, and is the trade centre of several counties. The chief manufacturing establishments are corn mills (the largest in the United States), railroad shops, iron works, flour mills, planing mills, agricultural implement works, engine and boiler works, casket and coffin factories, bridge works, and mantle factories. The government census of 1900 gives the number of manufacturing establishments, 239; the capital invested, $3,632,203; the number of wage earners, 2,313; the annual wages, $904,659; the cost of material, $3,690,802; and the value of the products, $5,896,492. The city has a large trade in grain, coal, live-stock, and manufactured products.

The principal public buildings are the government building, the county court-house, the municipal buildings, Saint Mary's Hospital, the churches (about 25 buildings), and the schools. There is a good system of public schools, including a well equipped high school. There are two parish schools. The principal departments of the James Milliken University are located here. There are three national banks. The government is administered under a charter of 1886 which provides for a mayor, who holds office two years, and a city council. The majority of the administrative officials are appointed by the mayor. The city attorney, treasurer, and clerk are elected by the people. The city owns and operates the electric light plant and the waterworks. Pop. (1890) 16,841; (1900) 20,754.

E. A. GASTMAN,
Supt. of Schools of Decatur, Ill.

Decatur, Ind., city, county-seat of Adams County; on the Saint Marys River, and the Grand Rapids & I., Toledo, S. L. & K. C. and

Erie R.R.'s; 20 miles southeast of Fort Wayne, and near the eastern boundary of the State. Its principal industries are the manufacturing of lumber, brick, and machinery, and stone-quarrying. It has municipal water and lighting plants. Pop. 4,142.

Decatur, Mich., town of Van Buren County; on the Michigan Central Railroad, 24 miles southwest of Kalamazoo. It is in a rich farming section and has an important trade in grain, fruit, celery, and peppermint. The industries are a large measure works, novelty factory, foundries, and manufactures of flour, stoves, etc.; and two grain elevators. Pop. (1900) 1,356.

Decatur, Texas, town, county-seat of Wise County; on the Fort Worth & Denver Railroad; 45 miles northwest of Fort Worth. The town is the trade centre of an agricultural region, and its industries are chiefly those of a cotton-growing country, with the quarrying of limestone. The Northwest Texas Baptist College is located here. Pop. 1,562.

Decazes, Elie, ā-lē dē-käz, Duc, French statesman: b. St. Martin du Laye, Gironde, 28 Sept. 1780; d. Decazeville, France, 25 Oct. 1860. He gained the confidence of Louis Bonaparte, king of Holland, whom he served even after his abdication in 1810, but joined the cause of the Bourbons in 1814, and under the second restoration discharged the duties of prefect of police at Paris with marked ability. In 1818 he became home minister, and in November 1819, premier. After the assassination of the Duke de Berry, in 1820, he resigned, and Louis XVIII. made him a duke, and his ambassador to England, where he remained till December 1821. Under the reign of Charles X. he opposed the extreme measures of the government, and after 1830, adhered to Louis Philippe. From 1834–48 he was grand referendary of the peers.

Deceased Wife's Sister Marriage Bill, a bill to legalize marriage between a man and the sister of his deceased wife that has been brought up in almost every session of the British Parliament since 1835, when Lord Lyndhurst secured the passing of a bill, which declared all such marriages null and void. The bill legalizing marriage with a deceased wife's sister has passed the House of Commons several times, but till 1896 was invariably rejected in the House of Lords, with, however, decreasing majorities. In 1896 the bill was passed by the lords, but went no farther. The Colonial Bill passed in the House of Commons more than 20 years ago, and in the House of Lords during the session of 1898, to make marriages of this class legally contracted in the colonies legal also in England, and the Scotch Bill, having a similar object, has also never been carried, though there are not wanting high authorities who pronounce such marriages legal in Scotland even now, without any special permissive legislation. It may be added that marriage with a deceased wife's sister has been specially legalized under the sanction of the Crown in all the Australian colonies, in Canada, Barbados, Ceylon, Mauritius, New Zealand, South Africa, and Jersey. Bills similar to the English bill have also been passed in Natal. These were, however, refused ratification (by the Crown) for special or technical reasons. Throughout India marriages of this kind are universally legal among all sects and creeds, except British subjects whose domicile is Great Britain. In every Christian country, except Great Britain, such marriages are legal.

December, the 12th month of our year, from the Latin *decem*, ten, because in the Roman year instituted by Romulus it constituted the 10th month, the year beginning with March. In December the sun enters the tropic of Capricorn, and passes our winter solstice. This month was under the protection of Vesta.

Decemvirs, dē sĕm'vĕrz, the 10 men appointed to codify the laws of ancient Rome. Commissioners were sent to Greece to study Greek statute law, and on their return (45 B.C.) all the magistracies were suspended, and a commission of 10 patricians (*decemviri legibus scribendis*) appointed with consular powers to reduce the laws to writing. The finished code, after being ratified by the comitia of the centuries, was erected in the Forum inscribed on 10 tables of wood. Next year the decemvirate was renewed, and added two tables. The whole code was known as the Twelve Tables (q.v.). The president of both the decemvirates was Appius Claudius (q.v.).

Dechamps, Adolphe, ä-dōlf dē-shäṅ, Belgian journalist and statesman: b. Melle 17 June 1807; d. near Brussels 19 July 1875. Early in life a disciple of Lamennais, he subsequently became an orthodox Roman Catholic. From 1843 to 1845 he was minister of public works, and from 1845 until August 1847, when the triumph of the liberal party led to his secession, minister of foreign affairs. From 1837 to 1851 he conducted the Catholic 'Revue de Bruxelles,' founded by himself and Dedecker. He was an able administrator and an influential parliamentary speaker. He was the author of: 'L'Empire et l'Angleterre' (1860); 'La France et l'Allemagne' (1865); 'Le Prince de Bismarck et l'entrevue des trois empereurs' (1873).

Decid'uous (Lat. *deciduus*, that falls down, from *decidere*, fall down, from *de*, down + *cadere*, fall), in botany, a term applied to various organs of plants, particularly leaves, to indicate their annual or periodic fall. When the calyx of a flower falls with the corolla it is called deciduous; when it falls on the expansion of the flower it is called caducous. Deciduous trees are those which for the most part annually lose and renew their leaves. In cold and temperate countries the fall of the leaf in autumn and the restoration of verdure to the woods in spring are among the most familiar phenomena of nature, connecting themselves also very intimately with the feelings, habits, and circumstances of mankind. The greater part of the trees and shrubs of temperate regions are deciduous; but within the tropics the forest retains always its luxuriance of foliage, except in countries where the dry season is extremely marked. There many trees lose their leaves in the dry season, and exhibit the same partial suspension of vegetative life. In warm countries the leaves of deciduous trees frequently remain for two or more years. Trees not deciduous are called evergreens, and evergreens never lose all their leaves at once.

Deciduous Teeth. See TEETH.

Decimal Arithmetic, the common system of arithmetic in which the figures or digits ranged in a row, increase in value by a multiple of ten as they are read from right to left, and decrease at a similar ratio from left to right. Also that part of the science of numerical calculation which treats of decimal fractions. See Fractions.

Decimal Fraction, a fraction whose denominator is a decimal or power of 10. Thus $\frac{1234}{100}$ is a decimal fraction. It may be decomposed into the sum

$$\frac{1000}{100} + \frac{200}{100} + \frac{30}{100} + \frac{4}{100}$$
$$= 10 + 2 + \frac{3}{10} + \frac{4}{100}$$

By an obvious extension of the method of local values, where each digit has 10 times the value of the like digit, which immediately succeeds it the above decimal fraction may clearly be written more concisely in the form 12.34, where the decimal point after the 2 merely serves to indicate which digit represents units.

In this abbreviated form a decimal fraction is termed a decimal. For the purpose of indicating the unit's place, other and less objectionable methods have been proposed. The operations of addition, subtraction, multiplication, and division may be applied to decimals in exactly the same manner as to integers; hence their great utility. They present, nevertheless, this disadvantage, that comparatively few fractional quantities or remainders can be exactly expressed by them; in other words, the greater number of common fractions cannot be reduced, as it is called, to decimal fractions, without leaving a remainder.

Common fractions, such as $\frac{1}{2}$, $\frac{2}{5}$, $\frac{1}{4}$, $\frac{3}{4}$, and $\frac{2}{25}$, for instance, can be reduced to decimal fractions only by multiplying the numerator and denominator of each by such a number as will convert the denominator into 10, or 100, 1,000, etc. (The common process is merely an abridgment of this.) But that is possible only when the denominator divides 10 or 100 without remainder. Thus, of the above denominators, 2 is contained in 10, 5 times; 4 in 100, 25 times; and 25 in 100, 4 times; therefore,

$$\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10} = .5; \quad \frac{1}{4} = \frac{1 \times 25}{4 \times 25}$$
$$= \frac{25}{100} = .25; \quad \frac{9}{25} = \frac{9 \times 4}{25 \times 4} = \frac{36}{100} = .36$$

But neither 3 nor 7 will divide 10 or any power of 10; and therefore these numbers cannot produce powers of 10 by multiplication. In such cases we can only approximate the value of the fraction.

Decimal System. See Metric System.

Decima'tion, in war, the selection of the tenth man of a corps by lot for punishment, as in case of a mutiny. It was early practised by the Romans. Sometimes every tenth man was executed, sometimes only one man of each company, the tenth in order, as was the case when the Saxons mutinied against Blucher before the battle of Waterloo.

The practice was followed by Essex at Dublin (1599), by the Austrians at Leipsic (1642), and by the French at Trèves (1675). The term is frequently used in a loose way for the destruction of a great but indefinite proportion of people, as of an army of inhabitants of a country.

Decip'ium, or **Decip'pium** (Lat. "deceptive"), a metallic element discovered by Delafontaine in the mineral samarskite, and also observed by him in sipylite. Decipium is not yet universally recognized among chemists as entitled to a place in the list of elements, but the symbol Dp has been assigned to it, and its atomic weight has been found to be about 171, if (as appears probable) its oxid has the formula Dp_2O_3. If the formula of the oxid is DpO, then the atomic weight must be taken as about 100. Decipium is said to possess properties that are very similar to those of cerium and gadolinium. It forms colorless salts, the acetate being easily crystallizable. The double sulphate of decipium and potassium is insoluble in a saturated solution of potassium sulphate, and advantage has been taken of this fact to effect the separation of decipium from terbium.

Decius, Gaius, gā'yŭs dē'shĭ-ŭs, **Messius Quintus Trajanus,** Roman emperor: b. Bubalia, Pannonia: d. 251 A.D. He reigned from 249 A.D. to 251 A.D. He persecuted the Christians, and perished with his army in a bloody battle near Abricium against the Goths, through the treachery of Gallus, who succeeded him as emperor.

Decius Jubellius, Roman general. He was appointed to the command of the Campanian legion, which had been stationed at Rhegium for its protection 281 B.C. Under pretext that the inhabitants were intending to betray the garrison to Pyrrhus, he perpetrated the greatest atrocities. Shortly after, having been attacked by a disease in his eyes, he sent to Messana for a physician, who happened to be a native of Rhegium. The physician, to revenge the cruelties inflicted on his countrymen, prescribed an application, enjoining Decius to continue it, however painful it might be, till the physician again returned. The pain became insupportable, and at length Decius found that his sight was destroyed. To complete his punishment, the Romans gave effect to the complaints of the citizens, and he perished by his own hands in a Roman prison.

Decius Mus, mŭs, Publius, Roman consul. In a war against the Latins 340 B.C., he devoted himself to death for his country, that is, after certain rites, rushed into the midst of the foes to certain death. His example was followed by his son, and, according to some historians, by his grandson. Such acts of self-devotion (*devotiones*) were not unusual at that time, when patriotism and piety exerted a powerful influence.

Deck, a horizontal platform or floor extending from stem to stern of a ship and covering in the hold. In ships of large size there are several decks one over the other. The topmost deck, which is indeed the main deck of a vessel, is called the spar or flush-deck; the portion of this which stretches from the foremast to the stem is called the forecastle. The quarter deck is in the stern.

Decken, Karl Klaus von der, kärl klows fŏn dăr dĕk'kĕn, German African traveler:

b. Kotzen, Mark of Brandenburg, 8 Aug. 1833; d. Africa 25 Sept. 1865. He entered the Hanoverian army, which he left after 10 years' service (1860) to follow his bent toward travel. On Barth's advice he went to Zanzibar, and started thence on a journey to Lake Nyassa, which failed through the treachery of his Arab guide. Next year he started on a second and successful journey to the mountain-regions of Kilima-Njaro. In the following year, with Kersten, he climbed that mountain to the height of 13,780 feet. In 1863 he made an extensive voyage along the east coast of Africa, after which he returned to Europe to plan a great expedition for the exploration of east African rivers. This journey ended in disaster, and Decken was murdered by a Somali.

Decker, Sir **Matthew,** English political economist: b. Amsterdam 1679; d. 18 March 1749. He went to London in 1702, and having embarked in commerce, attained the greatest success; was naturalized; received a baronetcy in 1716, and subsequently sat in Parliament. He published anonymously two pamphlets which were much discussed: one (1743) proposed to raise all the public supplies from a tax upon houses; the other, on the decline of Great Britain's foreign trade (1744), contained many good arguments for free trade.

Decker, Thomas. See Dekker, Thomas.

Declaration. (1) That part of the process or pleadings in which a statement of the plaintiff's complaint against the defendant is set forth, with the additional circumstances of time and place when and where the injury was committed, where these are requisite. (2) A simple affirmation allowed in certain cases to be taken instead of an oath or solemn affirmation. (See Affirmation; Oath.) In the United States, the form of an oath is immaterial, provided it be such as the witness believes is binding upon his conscience. It is essential that the oath, declaration, or affirmation be administered in a manner prescribed by law. Mere technical variations do not affect the validity of an oath, and verbal deviations are immaterial. Perjury may be committed although the person was improperly sworn. No person will be permitted to make a declaration or affirmation unless he has conscientious scruples against swearing or taking an oath. Declaration in lieu of an oath or affirmation is becoming very general throughout the United States. (3) The statement made by a prisoner, on being arrested on suspicion of a crime, which is taken down in writing.

Declaration, Dying. The rule that secondary or hearsay evidence is inadmissible suffers an exception, in law, in the case of a declaration made by a person convinced of his impending death, and who may not survive the trial of the accused. In Scotland, the dying declaration of a witness is admissible even though he is not himself conscious of the danger of death, and in the United States a declaration is frequently admitted, both in civil and in criminal cases, as primary evidence, without regard to the immediate apprehensions of death. The principle under which the dying declaration is admitted is that the awful situation of the dying person is as powerful over his conscience as the obligation of an oath, and does away with all motive to disguise the truth. Accordingly the person against whom a dying declaration is put in evidence may be allowed to show that the deceased was not of such a character as to feel the religious obligation of his situation. A dying declaration may be adduced for as well as against a person accused of crime; and there are cases on record in which persons charged with murder have been successfully exculpated on this kind of evidence.

Declaration of Independence, United States. The steps by which the extra-legal *de facto* governments of the colonies during the early Revolution — the committees of correspondence and safety — were turned into formal legislative bodies, are detailed under Constitutions, State, and Congress, Continental. But only a few persons, chiefly in the North, at first contemplated separation from the mother country. That they could have expected to conclude a victorious war by land and sea on any other terms, or to dissolve a successful common government and return to disintegrated nullity, seems so incredible that a certain section of historical scholars set down their professions of loyalty to sheer hypocritical falsehood. The history of sincere attempts at "conciliation" up to and far into the Civil War is sufficient answer to this charge. A still better answer is, that the alleged facts are misstated. The difficulty rises from a failure to notice the synchronism of events and views: opinions changed as circumstances changed. The war began in New England, and there it was readily seen to involve independence; the southern colonies thought the difficulty not beyond accommodation till the war was shifted to their own territory in the spring and summer of 1776, when they promptly came over; and the middle colonies, which the war did not touch till after the Declaration, fought it almost to the last. No coincidences are more striking than that the attack on Fort Moultrie was on 28 June 1776, and the South Carolina delegates changed their votes from no to yes 1 July; and that while the New York delegates refused to vote on the Declaration for lack of authority, it was ratified by a New York convention a week after Howe's arrival at Staten Island, 30 June.

The first Congress, of 1774, assumed neither executive nor legislative authority. The second, early in its existence (6 July 1775), formally disclaimed any purpose of separation. The first half-unconscious step was the appointment, November 1775, of five commissioners to maintain communications with friends of the colonies in "Great Britain, Ireland, *or elsewhere*": only independent countries send ministers. Thomas Paine's 'Common Sense,' urging independence as inevitable, and the sooner the better, appeared 9 Jan. 1776; it had wide influence, and unlocked many tongues. So general was the concurrence with Paine's views that in fear of them, three of the middle colonies — New Jersey, Pennsylvania, and Maryland — instructed their delegates to vote against any such measure; the other two, New York and Delaware, were bitterly divided, and their delegates took no part in forwarding the independent movement; South Carolina was also hostile, contrary to its usual habit of eager initiative — probably from fear of England stirring up the great Indian confederations against the South, as was afterward done. But events pushed them on. British naval captures led Congress,

23 March to declare all British vessels lawful prize and on 6 April it opened all United States ports to vessels other than British. This was in effect a declaration of sovereignty, acknowledged or not. The colonies, under instructions from Congress, were steadily forming State governments (see CONSTITUTIONS, STATE); and Congress on 15 May recommended all the remaining ones to take the same step, which all of course did, vesting making their common Union independent also. John Adams was the foremost agent in all this work. The North Carolina convention 22 April resolved to "concur with those in the other colonies in declaring independence." On 17 May Virginia instructed her delegates in Congress to move a "Declaration of Independence"; and on 7 June Richard Henry Lee made a motion to that effect in Congress, which was seconded by John Adams. On the 8th and 10th this was debated in committee of the whole; but action was postponed to 1 July, as some delegations were averse and others were waiting instructions.

On the 10th a committee of five was appointed to draw up the Declaration: Thomas Jefferson of Virginia, John Adams of Massachusetts, Benjamin Franklin of Pennsylvania, Roger Sherman of Connecticut, and Robert R. Livingston of New York. Its composition was assigned to Jefferson by the committee; the latter and Congress made many changes, but mostly by omission rather than alteration of wording, so that the language is practically all Jefferson's. The chief cancellations were five: (1) and (2) The last two counts of his indictment of the King. (1) That he had "incited treasonable insurrections of our fellow-citizens" by promising them confiscated property. The charge was probably felt to be too weak to maintain, as well as likely to weaken the general case. (2) That he had carried on the slave-trade, and refused to allow American legislatures to suppress it. South Carolina and Georgia, which were actively carrying it on themselves, would not permit this; and too much Northern wealth had been earned by it not to make the North very willing to suppress the passage, which would impress foreign nations unpleasantly as to their sincerity. (3) Superfluous rhetoric about the incredulity of "future ages" as to the daring tyranny of the king. (4) Review of American history, denying that Great Britain had assisted in our establishment, and alleging that "submission to their parliament was no part of our constitution." It was thought best to go as little into the remote origins as possible, fixing the attention upon recent oppressions and natural rights; and above all, to ignore the existence of parliament altogether. That body is not alluded to, except inferentially as the "others" with whom the king has "combined" to subject the colonies to an alien and illegal jurisdiction. This was in pursuance of the steady contention of the colonies. (5) Attacks on the English people for re-electing "the disturbers of our harmony," and allowing their chief magistrate to perpetrate these enormities. This was struck out to avoid giving offense to the friends of the colonies in England, who in fact, by upholding Liberal leaders and even generals, saved us at last.

The Declaration was reported 28 June. On 1 July as fixed, debate was begun afresh on Lee's resolution. New Jersey and Maryland had reversed their instructions meantime. In committee of the whole that evening, nine States voted for it; Pennsylvania and South Carolina voted against it (but the latter delegates, possibly after hearing from the South, offered without instructions to vote yes if it would make a unanimous vote), Delaware was divided, and New York, as above stated, refused to vote. The "yea" Delaware delegate, McKean, sent an urgent message to the third, Cæsar Rodney, then on a political trip in southern Delaware, to come on at once; Rodney traveled 80 miles the next day, arrived in the evening, and reversed his State's vote. Pennsylvania reversed hers also; and this leaving only the abstaining New York delegates out of the voting, the South Carolina members voted yes. This carried the motion that "these united colonies are and of right ought to be free and independent States, that they are absolved from all allegiance to the British Crown, and that all political connection between them and the state of Great Britain is and ought to be totally dissolved," by 12 yeas and no negative vote. On the 3d the Declaration was taken up, and as amended was passed on the evening of the 4th. The anniversary of the fact of independence is therefore the 2d; that of the adoption of the specific document in which it was proclaimed to the world is the 4th, as celebrated. The usual statement that it was "signed" by the members at this time, however, is incorrect; it was signed by the president and secretary, whose signatures only were borne by the printed copies sent out. The journals of Congress did not enter the Declaration, but left a blank for it, which was afterward filled in and the signatures taken from the engrossed copy. On the 9th the New York convention ratified it, and the delegates gave in their formal adherence on the 15th; it was then, as entitled, "The Unanimous Declaration of the Thirteen United States of America." Six additional Pennsylvania members also recorded a formal vote on the 20th. On 19 July Congress passed a resolution that it should be engrossed on parchment, and on 2 Aug. it was signed by 53 members present; Gerry of Massachusetts, McKean of Delaware, and Thornton of New Hampshire were empowered by their legislatures to sign later, Thornton not signing till 4 Nov.

The parchment with the original signatures was deposited with the Department of State when the government was organized in 1789. In 1823 John Quincy Adams had a copper-plate facsimile made, to give copies to the signers and their heirs; but unfortunately it ruined the original. The wet sheet pressed on the face drew out the ink so that the signatures have become illegible and almost invisible, and the text partially so; and after being shown for many years only on special occasions, in 1894 it was definitely sealed up in a steel case to keep it from light and air. From 1841 to 1877 it was in the Patent Office.

The signers represented the States as follows:

New Hampshire: Josiah Bartlett, William Whipple, Matthew Thornton.

Massachusetts: John Hancock, Samuel Adams, Robert Treat Paine, Elbridge Gerry.

Rhode Island: Stephen Hopkins, William Ellery.

Connecticut: Roger Sherman, Samuel Huntington, William Williams, Oliver Wolcott.



FROM THE PAINTING BY TRUMBULL.

SIGNING OF THE DECLARATION OF INDEPENDENCE.

New York: William Floyd, Philip Livingston, Francis Lewis, Lewis Morris.

New Jersey: Richard Stockton, John Witherspoon, Francis Hopkinson, John Hart, Abraham Clark.

Pennsylvania: Robert Morris, Benjamin Rush, Benjamin Franklin, John Morton, George Clymer, James Smith, George Taylor, James Wilson, George Ross.

Delaware: Cæsar Rodney, George Reed, Thomas McKean.

Maryland: Samuel Chase, William Paca, Thomas Stone, Charles Carroll of Carrollton.

Virginia: George Wythe, Richard Henry Lee, Thomas Jefferson, Benjamin Harrison, Thomas Nelson, Jun., Francis Lightfoot Lee, Carter Braxton.

North Carolina: William Hooper, Joseph Hewes, John Penn.

South Carolina: Edward Rutledge, Thomas Heyward, Jun., Thomas Lynch, Jun., Arthur Middleton.

Georgia: Button Gwinnett, Lyman Hall, George Walton.

It may be noted that several of these were not members of Congress when the Declaration was passed.

The Declaration, as agreed to, follows:

A DECLARATION

BY THE REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED.

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal; that they are endowed by their Creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that, whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and, accordingly, all experience hath shown, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But, when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these colonies, and such is now the necessity which constrains them to alter their former systems of government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having, in direct object, the establishment of an absolute tyranny over these States. To prove this, let facts be submitted to a candid world:

He has refused to assent to laws the most wholesome and necessary for the public good.

He has forbidden his governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and, when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the legislature; a right inestimable to them, and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved representative houses repeatedly, for opposing, with manly firmness, his invasions on the rights of the people.

He has refused, for a long time after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the State remaining, in the meantime, exposed to all the dangers of invasion from without, and convulsions within.

He has endeavored to prevent the population of these States; for that purpose, obstructing the laws for naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

He has obstructed the administration of justice, by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of new offices, and sent hither swarms of officers to harass our people, and eat out their substance.

He has kept among us, in times of peace, standing armies without the consent of our legislatures.

He has affected to render the military independent of, and superior to, the civil power.

He has combined, with others, to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us:

For protecting them by a mock trial from punishment, for any murders which they should commit on the inhabitants of these States:

For cutting off our trade with all parts of the world:

For imposing taxes on us without our consent:

For depriving us, in many cases, of the benefit of trial by jury:

For transporting us beyond seas to be tried for pretended offenses:

For abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render it at once an example and fit instrument for introducing the same absolute rule into these colonies:

For taking away our charters, abolishing our most valuable laws, and altering, fundamentally, the powers of our governments:

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever:

He has abdicated government here, by declaring us out of his protection, and waging war against us.

He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.

He is, at this time, transporting large armies of foreign mercenaries to complete the works of death, desolation, and tyranny, already begun, with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow-citizens, taken captive on the high seas, to bear arms against their country, to become the executioners of their friends and brethren, or to fall themselves by their hands.

He has excited domestic insurrections amongst us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian savages, whose known rule of warfare is an undistinguished destruction of all ages, sexes, and conditions.

In every stage of these oppressions we have petitioned for redress in the most humble terms; our repeated petitions have been answered only by repeated injury. A prince, whose character is thus marked by every act which may define a tyrant, is unfit to be the ruler of a free people.

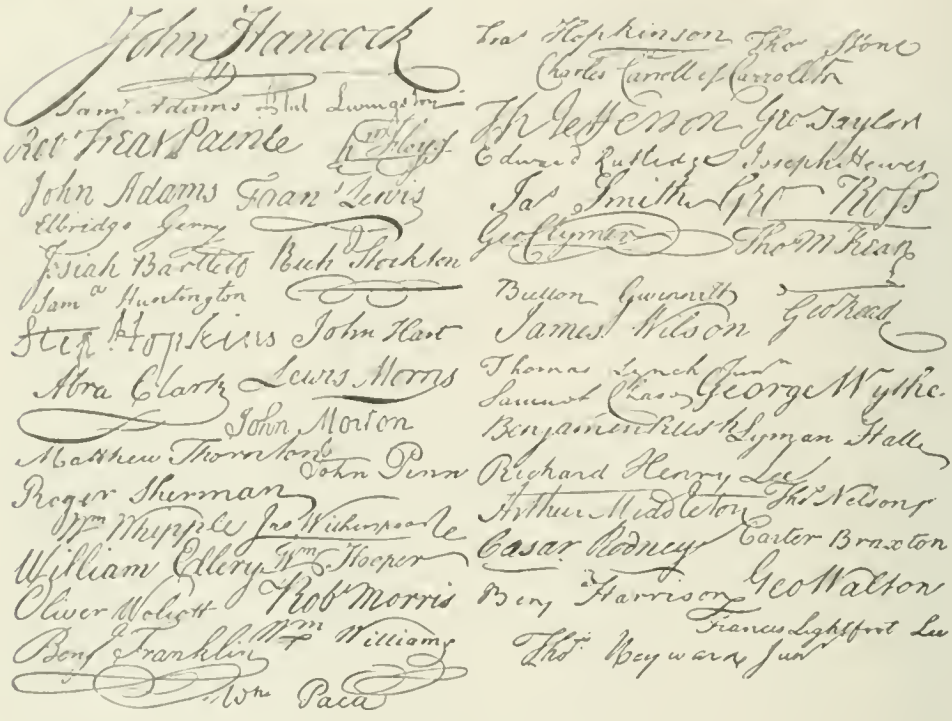
Nor have we been wanting in attention to our British brethren. We have warned them, from time to time, of attempts made by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them, by the ties of our common kindred, to disavow these usurpations, which would inevitably interrupt our connections and correspondence. They, too, have been deaf to the voice of justice and consanguinity. We must, therefore, acquiesce in the necessity which denounces our separation, and hold them, as we hold the rest of mankind, enemies in war — in peace, friends.

We, therefore, the representatives of the United States of America, in General Congress assembled, appealing to the Supreme Judge of the World for the rectitude of our intentions, do, in the name and by the authority of the good people of these colonies, solemnly publish and declare, That these United Colo-

[illegible] Free and Independent States, that they are absolved from all allegiance to the British Crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and that as Free and Independent States, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which independent States may of right do. And for the support of this declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other, our lives, our fortunes, and our sacred honor.

Howell, 'State Trials'; Burnet, 'History of James II.'; Fox, 'Reign of James II.'

Declaration of Paris, 1856. Between the Napoleonic wars and the Crimean war, industrialism in European societies had made great advances over militancy; and the interests of peaceful trade, for the first time in history, were felt even by the most powerful nations to be more important than those of destruction. In



Declaration of Indulgences, a name applied to the declaration or proclamation issued by Charles II. (1672), and also to a proclamation of James II. (1687), which were virtually acts granting liberty of conscience to all whose rights to their own methods of worship had been curtailed by the Conventicle and Five Mile Acts. These royal acts and declarations of Charles and James suspended the enforcement of the penal status which had been made against the Roman Catholics and Nonconformists, and removed the test of qualification for the holding of civil or ecclesiastical office. James II. ordered the declaration to be read in the churches, 25 April 1688. The primate and six bishops of the Church of England protested against the order, saying it was intended to benefit the Roman Catholics and that it was illegal. The king declared their act seditious libel against the crown, and sent the offenders to the Tower. Later they were tried and acquitted, 30 June 1688. On the day of their release an invitation was sent to William of Orange to come and save England from the Roman Catholics. The signers of this invitation who wished the downfall of James II, were the Earls of Danby, Devonshire, and Shrewsbury, and the bishop of London and other bishops. (See Test Act.) Consult:

opening that war, therefore, the allies — England, France, and Italy — announced their intention to respect the goods of neutrals on the sea as never before; to spare from capture either neutral goods on enemies' ships or enemies' goods on neutral ships, excepting contraband; and not to issue letters of marque for privateering. After the war, at the Congress of Paris, 16 April 1856, the contracting powers publicly declared that the unsettled condition of maritime law bred disputes and conflicts, and that a uniform policy should be established; wherefore they adopted the following "solemn declaration," to bind whoever acceded to it, but exclude either from its obligations or its privileges those who did not: (1) "Privateering is and remains abolished"; (2) "The neutral flag covers enemy's goods, with the exception of contraband of war"; (3) "Neutral goods, with the exception of contraband of war, are not liable to capture under an enemy's flag"; (4) "Blockades, in order to be binding, must be effective — that is to say, maintained by a force sufficient really to prevent access to the coast." This was signed by the delegates from Great Britain, France, Austria, Prussia, Sardinia, Russia, and Turkey; all other civilized maritime nations acceded except Spain, Mexico, most of the South American

states, and the United States, which refused on account of their small navies, making a resort to privateering imperative in case of war. This country, however, through its secretary of state, Wm. L. Marcy, offered to accede on condition of what was known as the "Marcy Amendment," to exempt all private property from capture on the seas; privateering would thus become objectless and cease. This was declined, and United States goods remained at the mercy of any two powers at war. On the outbreak of the Civil War, Great Britain and France recognized the Confederacy as a belligerent, and the latter at once issued letters of marque; Mr. Seward for the United States, requested permission to subscribe to the Declaration; but the former powers would only agree on condition of its not invalidating the Confederate rights. Nothing further was was ever done about it; but in 1898 the United States and Spain, both outside the Declaration, proclaimed their intention to respect it. Sections 2 to 4 are recognized international law; and as privateers are now replaced by fast cruisers in strong navies, privateering is practically though not formally obsolete.

Declaration of Rights. The Stamp Act Congress (q.v.) of 1765 published a "Declaration of Rights and Grievances of the Colonists of America," protesting against the Stamp Act, and any other effort to tax the colonists while denying them representation in the Parliament which imposed the taxes. They sent a petition to the king, and another to Parliament, claiming the same rights as were enjoyed by Englishmen born within the British Isles. The right of representation was included in these; but instead of petitioning for that right, they declared its obvious impossibility a reason why they should not be subject to taxation. The Continental Congress of 1774 (see CONGRESS, CONTINENTAL) asserted a similar claim in its declaration, as a preliminary to calling a final congress, and the Declaration of Independence begins a like assertion. The assertion of such claims was considered so vital in written constitutions by men of that age, that the strongest objection to our national one was its omission in this particular, and the storm of amendments pushed forward (see *Amendments, History of the*, under CONSTITUTION) consisted mainly of bills of rights.

Declaration of War, a public proclamation by one government in which it declares itself to be at war with another. The use of the telegraph nowadays and the wide diffusion of news, by which every incident in the events which lead to a war are instantly published, make such a formal declaration scarcely necessary, and each belligerent is usually satisfied with announcing its warlike intentions to its own subjects and to neutrals. In the United States Congress alone has the power to declare war, and when that body votes for war with a foreign power such a measure is considered tantamount to a declaration of war.

Declar'atory Act, an act passed by the English Parliament 7 March 1766, accompanying the repeal of the Stamp Act, asserting the constitutional right of the king, with the advice of Parliament, to bind the colonies by its laws and action "in all cases whatsoever." This is English colonial law still; but no attempt has since been made to enforce it against the wishes of the colonies, except where the rights of British subjects have been infringed.

Decle, dā-kl, **Lionel,** English explorer and author: b. Rocourt, St. Quentin, France, 16 May 1859. He is of French parentage but is a naturalized Englishman. He has traveled extensively in Asia, Africa, and America, was on the staff of the *Pall Mall Gazette* for several years and commanded the *Daily Telegraph* expedition from the Cape to Cairo (1899–1900). He has published: 'Three Years in Savage Africa'; 'Trooper 3809,' an account of his personal experience in the French army.

Declension, the change of termination in certain classes of words, in various languages, to indicate the relation in which those words stand toward other words in a sentence. The condition of change to which the words are brought by the several terminations, are styled cases (Lat. *casus*) or fallings, the ancient Latin grammarians representing the nominative as the *casus rectus*, or upright, perpendicular case, while the rest sloped gradually down at various angles, until the ablative was a horizontal line, set at right angles with the nominative. The words subject to declension are of the classes, noun, adjective, pronoun, article. In the Latin language grammarians generally recognize five declensions, five different modes of forming cases, and to each declinable word they assign five cases namely the nominative, genitive (or possessive), dative, accusative (or objective), vocative (or interjectional), and ablative. There is also a locative case, used in the names of cities, and in such forms as humi, domi. Example, nominative *hortus*, garden; genitive, *horti sepes*, the garden's hedge; dative, *horto additum*, added to the garden; accusative, *hortum colo*, I cultivate the garden; vocative, *o horte*, O! garden; ablative, *horto disjuncta ædificia*, buildings separated by a garden. This word *hortus* belongs to the second declension: the first declension has the same five cases, for example, *ala* (wing), genitive, *alae*, dative, the same, accusative *alam*, vocative *ala*, ablative, the same save in prosodical quantity, *alā*. An example of the third declension would be *ales* (bird, winged) *alitis, aliti, alitem, ales, alite;* of the fourth declension *usus* (use), *usus, usui, usum, usus, usu;* of the fifth, *fides* (faith, trust) *fidei, fidei, fidem, fides, fide*. The examples show the process of declension in the singular number: for the plural number let one example suffice; the plural cases of *servus* (slave), are *servi, servorum, servis, servos, servi, servis:* in the plural the nominative and vocative are always of the same form; so, too, are the dative and ablative. The Greek declensions are variously classified, but most generally made three in number and the cases five, as well as two dialective locative cases. The ancient Sanskrit language has eight cases of nouns and the present language of the Finns has 15: but the languages of western Europe derived from Latin — Italian, Spanish, Portuguese, French, etc.— have dropped the declinational terminations of the Latin, and hence the Latin for "man," which is declined *homo, hominis, homini, hominem, homo, homine*, has in those modern languages the one form *homme* in French, *uomo* in Italian, *hombre* in Spanish. The ancient Germanic language, from which English is descended, had declensions; but in our language the only remnants of the an-

ment for nature, the possessive case of nouns and [illegible] of pronouns, I, me; he, him; we, us; they, them. While in the Indo-European languages above cited, as well as in the Semitic tongues, the unity of the word is not destroyed by inflection, in languages like the Turkish, which are styled agglutinative, elements are added in succession which supersede or obscure the individuality of the original word.

Declination, in astronomy, the distance of a heavenly body from the celestial equator (*equinoctial*), measured on a great circle passing through the pole and also through the body. It is said to be north or south according as the body is north or south of the equator. Great circles passing through the poles, and cutting the equator at right angles, are called circles of declination. Twenty-four circles of declination, dividing the equator into 24 arcs of 15° each, are called hour circles or horary circles.

Declination, Magnetic. See MAGNETISM, TERRESTRIAL.

Declination Needle, or Declinometer. The magnetic meridian passing through any place on the earth's surface is a vertical plane whose direction is that in which a magnetic needle, free to move about a vertical axis, comes to rest under the influence of the earth's magnetic force. In general, the magnetic and geographical (or astronomical) meridians are not coincident; the angle between is termed the magnetic declination, or (in nautical phraseology) the variation. It is east or west, according as the magnetic is east or west of the geographical meridian. Any apparatus for the measurement of this angle is termed a declinometer, and consists essentially of a means of ascertaining the two necessary elements — namely, the directions, at the place of observation, of the two meridians. Permanently fixed instruments of this nature are set up in all magnetic observatories. They are generally self-registering, and record the slightest hourly, diurnal and annual variations in the declination of the magnetic needle, as well as the more violent changes due to magnetic storms.

Decline and Fall of the Roman Empire, The, a monumental work by Edward Gibbon, the first volume of which appeared in 1776, and the last in 1788. 'The Decline and Fall' has been pronounced by many the greatest achievement of human thought and erudition in the department of history. It is a history of the civilized world for 13 centuries, during which paganism was breaking down, and Christianity was superseding it; and so bridges over the chasm between the Old World and the new. It is marked by dignity of style and picturesqueness of narration. The great criticism of the work has always been upon the point of Gibbon's estimate of the nature and influence of Christianity.

Decoction, in pharmacy, a solution of a vegetable principle largely obtained by boiling in water the substance containing the principle. Inasmuch as plant drugs usually yield their constituents more readily to hot water than they do to cold water, decoctions are preferred to infusions for obtaining the active principles of plants. Decoctions are not very much used at the present time, because of their great complexity, the active principles of plants being obtained by other means.

Decoïc Acid, or Capric Acid, an organic acid having the formula $C_{10}H_{20}O_2$, and occurring in the form of various compounds in butter, cocoanut oil, fusel oil (from certain sources), Limburg cheese, and the fatty matters extracted from the wool of sheep. It is soluble in alcohol and ether, but almost insoluble in cold water. It crystallizes in needles that have a faint odor suggestive of rancid butter, and is prepared by the distillation of oleic acid, or by the oxidation of that acid by nitric acid. The name "capric" has reference to the fancied resemblance of the odor to that of a goat; while "decoic" refers to the 10-carbon atoms that the acid contains.

Decomposition, Chemical, is the separation of the constituents of a body from one another, these constituents being obtained either free or in a new state of combination. Limestone, for example, is decomposed into lime and carbonic acid, oxide of mercury into mercury and oxygen, by heat. This is called simple decomposition. Definite organic bodies resemble inorganic in being influenced by similar forces, but the result in their case is somewhat different, arising from their different composition. In the case of an organic body it is possible to convert its constituents at once into their simplest states of combination, but it is also possible to obtain a large number of intermediate compounds by regulating the decomposing action. The process by which such bodies are thus decomposed is styled by chemists compound decomposition.

De Coninck, Pierre Louis Joseph, pē-ār loo-ē zhō zĕf dė kō-năńk, French genre painter: b. Meteran, Nord, 22 Nov. 1828. He was a pupil of Leon Cogniet, and won the second prize of Rome in 1855, taking medals in 1866 and 1868 and a third class medal in 1873. Among his works are: 'Eva and Uncle Tom' (1857); 'Woman Bathing at Capri' (1863); 'Torture of Queen Brunhaut'; 'Ballet Girl Resting' (1864); 'Christ Blessing Little Children' (1865); 'Two Friends' (1866); 'Lavandara' (1867); 'The Ordeal' (1869); 'Little Charmer' (1870); 'The Ring' (1873); 'Kittens' (1874); 'Pastorella'; 'Hare in Trap' (1881); 'The Trappist.'

Decorah, dē-kō'ra, Iowa, city, county-seat of Winneshiek County; situated near the northeastern corner of the State on the Iowa River, about 30 miles from its mouth, and on the Chicago, Milwaukee & St. Paul Railroad. The city has manufactures of paper, flour, and agricultural machinery. The water-plant is owned by the city. A Norwegian Lutheran College and the Breckenridge Institute are located here. Pop. (1900) 3,246.

Decorated Style, the second style of pointed (Gothic) architecture, in use in Great Britain from the end of the 13th to the beginning of the 15th century, when it passed into the Perpendicular. It is distinguished from the Early English, from which it was developed, by the more flowing or wavy lines of its tracery, especially of its windows, by the more graceful combinations of its foliage, by the greater richness of the decorations of the capitals of its columns, and of the moldings of its doorways and niches, finials, etc., and generally by a style of ornamentation more profuse and naturalistic, though perhaps somewhat florid. The most dis-

tinctive ornament of the style is the ball-flower, which is usually inserted in a hollow molding. The Decorated style has been divided into two periods, namely, Early or Geometrical Decorated period, in which geometrical figures are largely introduced in the ornamentation; and the Decorated style proper, in which the peculiar characteristics of the style are exhibited. To this latter period belong some of the finest monuments of British architecture. See ARCHITECTURE.

Decoration Day, a holiday observed in many States as an occasion for decorating the graves of soldiers killed in the Civil War, whether in national or private cemeteries. The custom of "Memorial Day" (as it is otherwise called) originated with the Southern States, and was copied scatteringly and on different days in some Northern States,—all in the spring, for natural reasons. On 5 May 1868 Gen. John A. Logan, then commander-in-chief of the Grand Army of the Republic, issued an order appointing 30 May of that year for Grand Army services in so decorating graves — choosing that day possibly as being the date of discharge of the last Union volunteer of the War. The States which observe the day have adopted it singly, there being no national law on the subject.

Decoration, Interior, in the United States. During the last quarter of the 19th century much attention was excited in the Atlantic coast cities by the attempts, which began to be seen and heard of, at rich decoration of houses and churches. There had been, before that time, little of consequence; the plastered adornments of the old colonial houses still existed, and these were sometimes copied, clumsily or otherwise; and there were a few public buildings in which an historical painting or two was put up; but decoration in a larger sense had hardly been undertaken.

Five years after the close of the Civil War some architects in New York and Boston began to try to increase their own charge of the dwelling-house in hand by making careful original designs for interior woodwork, with stairs and fixed sideboards and chimney-pieces, and even in the way of wall-painting of decorative character. All this work could be done from drawings made in the architect's office, always supposing that he had surrounded himself with draughtsmen of good capacity in other than merely mechanical drawing. Thus, excellent wood-carving, in solid oak plank or in delicate panels of holly or mahogany was carried out even to the adornment in a very complete fashion of large staircases and entrance-halls. The painting, too, though limited to scrolls and floriated work, was in the way of considerable artistic development and promised well. The exhibition at Philadelphia in 1876 increased the interest in these with all the other decorative arts, by spreading further West and South the knowledge of their existence and of the possibilities connected with them. The result of this was seen in the establishment of studios, and also of more commercial establishments intended for the making and application of interior decorations of all sorts — from costly mural paintings and brilliant stained glass down to the simplest carved and molded mantlepieces and dadoes. The difference between the two classes of establishments should be made clear, for the establishment devoted to interior decoration, like that devoted to upholstery and the making of furniture is of necessity commercial in its aims, and will, as a general thing, sell to the buyer what he demands except in so far as the persuasions of the salesman or superintendent can lead him to adopt another view than that which he held originally. The atelier or studio, on the other hand, is the workshop of an artist who, in his capacity as artist, undertakes to give nothing which he does not approve. Although some of the more commercial establishments are directly controlled by able and conscientious artists, the distinction stated above is still to be maintained, and the test is that such a studio as described above will offer nothing for sale, will have nothing that could be sold, will undertake a piece of decoration under the usual limitations and with the usual desire to please the owner of the house, but also limited by the artists' conditions as to what is right.

The establishment of these workshops of different kinds very soon put out of their course the few architects who had desired to undertake such work themselves. When a painter or sculptor would undertake the richer decorations of certain parts of the house, it was natural to leave the less elaborate ones also to him. Only a few of the offices of architects will now undertake decorative work beyond the very simple full-size drawings made for plaster ceilings and molded door-trims. Another influence, also, has appeared — the clever and energetic work done by the larger upholsterers in the great cities, some of whom undertake decoration on a large scale. The student of such things should not lose sight, however, of the essential distinction between work which is done in the commercial way with the single purpose of pleasing the buyer, and that which is done in the artist's way with the primary purpose of being as good as possible within the limits set by the buyer.

The larger and more monumental paintings of which there is so much to be told, began with the decorations by John LaFarge of Trinity Church in Boston, and the paintings by William Morris Hunt in the Capitol, or State House, in Albany, N. Y. These are nearly contemporaneous. Trinity Church having been recently built by H. H. Richardson, LaFarge was set to work in 1876, having several assistants, since well known as decorative painters on their own account. The interior of the church is filled with paintings, chiefly of figure subjects, of which subjects the best known are 'Christ and the Woman of Samaria,' and 'Christ and Nicodemus.' The work of the whole decoration is chiefly a matter of warm color. Mr. Hunt's paintings in the capitol were singularly unfortunate, for, having been painted on the wall directly, they were soon injured by the unequal settlement of the building and then were concealed entirely by the changes which had to be made. They were finished at the beginning of 1879 and in 10 years from that time were lost to sight forever. Their subjects were emblematic and metaphorical in a large way, 'The Flight of Night' and 'The Discoverer.' The purpose of Hunt in painting his decorations directly upon the wall deserves all honor, and it is greatly to be wished that those who have followed him in producing the important mural paintings of America would have followed the same rule. The process of *marouflage,* by which

the artist paints upon a great canvas which is afterwards placed upon the wall, has many advantages, but it should certainly be arranged so that the work on this canvas should be done in the room to be decorated by it, and in the light and with the surroundings which are to be its permanent conditions.

The Albany capitol had been put into the hands of an artistical commission consisting of Leopold Eidlitz, H. H. Richardson, and Frederick Law Olmsted. This was done about 1874, and after a short interval of time the work still needing to be done upon the building was divided between the two architects, Mr. Eidlitz taking the north side on Washington Avenue, with the assembly chamber and its accessories, and Mr. Richardson the south side, with the senate chamber. The interior decorations were very different in character each from the other, but each was carried out in a very elaborate fashion without much reference to the original design of the building, which, indeed, was almost entirely changed in character from the third or principal story upward. Richardson's decorations were extended afterwards to include the great staircase at the western end of the building, the elaborate hall and annexed chambers of the Court of Appeals and the State Library. Great originality was shown in these: the woodwork of the galleries, the screens and dwarf partitions, the tribunes and desks for presiding officers and judges, the great chimneypieces and the ceilings were treated with extraordinary vigor and intelligence, and they remain among the most instructive work of independent thinking in design that has been done in America. With the aid of certain sculptors who devoted themselves to this decorative work, among whom should be named John Francis Brines, the elaborate stone-built staircases received an architectural decoration closely akin to that of the porches of entrance; elaborate leafage of the Byzantine type, especially invented and developed for the occasion, was combined with heads (either portraits or ideal portraits) of prominent natives of New York, and ideal heads were introduced in other parts of the work. There was no mural painting done in the capitol other than the pictures by Hunt, mentioned above, nor was there any stained glass used there.

About 1878 John LaFarge contracted with Cornelius Vanderbilt for a carved ceiling in Mr. Vanderbilt's house in New York; the smaller house which was the nucleus of the vast palace that now stands at Fifth Avenue and 57th Street. This ceiling was then carried out in the richest possible way. There was much decoration in relief, ideal figures, and the panels containing them framed and enclosed by molded and carved beams and cross beams so that each panel was treated nearly like a caisson. But the peculiarity of this was that the reliefs were all in polychromy and that very rich materials were used to produce the color effect desired. Glass, in masses (colored and cast for the purpose), bronze (and that of many tones and shades), marble, ivory (sometimes stained), mother-of-pearl and even silver were used in these extraordinary decorations. The same room contained a mantelpiece with a high structure above it of pilasters carrying a special entablature, and all this was inlaid with mother of pearl in a very brilliant way. The designs were singularly free from the modern American fault of following old styles, even to the extent of copying too closely special examples of these styles. It would be impossible to say that any ancient style suggested the treatment adopted.

By 1880 it had become rather common for architects, when employed to build the very costly houses of the new-made millionaires, to recommend to their employers the sculptors and mural painters who could fill these private palaces with decorative art of the highest class. The Villard house in New York, afterward belonging to Whitelaw Reid, was one of the earliest of these, and this contains what are perhaps the finest mural paintings that LaFarge has done: the two lunettes, 'Music' and 'The Dance'; but very soon this was rivalled by houses built in the same city and in Boston and Chicago. George B. Post of New York has been especially successful in obtaining for the finer adornment of his buildings the work of the best men in both the great arts of expression. He was the architect of the Cornelius Vanderbilt house in its former and in its later and much enlarged form, and also of the house of Collis P. Huntington, and had charge of the decorative re-arrangement of the Lawyers' Club in New York and of banking houses in different parts of the country.

There was another singular manifestation of the disposition to adorn buildings of residence, for the great hotels began to find it necessary to pay for costly pictures to adorn their reading and lounging rooms, their dining-rooms and smoking-rooms, and the like. Mr. Hardenberg's hotels showed this tendency among the earliest, for in the Waldorf there is a really splendid ceiling by Will H. Low, representing 'The Triumph of Venus,' and many lunettes and smaller wall-paintings. In the Astoria, adjoining the Waldorf, there are other similar decorations. In the Manhattan there is a long and broad frieze of painting by Charles Y. Turner, representing 'The Triumph of Manhattan,' and in the café a landscape decoration by Frederick Crowninshield, running all around the large room and showing above the high dado of light-colored wood. This last named achievement is a wonderful success in that while the solidity of the wall is not destroyed by the treatment, there is still a far-away look of the Roman campagna with the distant mountains, while in the foreground life-size figures seem to look over the solid wall formed by the wooden dado. Mr. Crowninshield has carried out and enlarged the same style of decoration in his paintings of a certain restaurant at the top of a large department store on 6th Avenue, New York, and this is the most remarkable instance that we can name of the willing acceptance of so elaborate and so purely artistic a decoration in a building devoted to purely commercial purposes.

Decoration other than painting and other than sculpture of human figures has been used in the "office buildings," or great structures built in the business quarters of the cities and rented out in separate rooms or suites of rooms to lawyers, brokers, agents and business men of all sorts, other than the keepers of shops and stores. These buildings since 1875 have been high, fitted with elevators, and solidly built, and since 1885 have been commonly constructed on the "steel cage" principle, which allows of buildings of any height and of rapid construction. This has been the era of the "sky-scrapers,"

which range from 16 to 24 stories, and require a great number of elevators in proportion to their size. A great deal of elaborate work in the way of marble linings, floors of mosaic, of gray and white and black tesseræ, and, unfortunately for safety, highly wrought woodwork in the way of door-trims and window-trims and mantelpieces have been used. There has been some slight attempt to carry out decorative designs in stucco and similar varieties of what may be called in a general sense, plastering. This art has, of course, indefinite possibilities, and there is hope that another generation of artists will see in marble the material for the lining of walls near the foot and where they are most exposed to injuries, while above a certain line the easy method of modelling bas-reliefs in cement or stucco and then painting them in polychromy will be followed.

The Chicago World's Fair, held in 1893, gave much employment to the mural painters and to the sculptors of America during the three or four years preceding its opening. These decorations must not detain us here, because they all vanished with the occasion. It is, in a way, a pitiful thing that the very important paintings of the cupolas and lunettes of those buildings disappeared within a year from the time of their completion.

There are certain public buildings in which it will surprise the student to find very splendid and interesting work, especially in mural painting, where he would certainly look for no such adornment. Thus the Criminal Court-House in Centre Street, New York, has received certain mural paintings by Edward Simmons, ordered and paid for by the Municipal Art Society, and these pictures consist of a central composition of 'Justice,' and two side pictures arranged like a frieze, 'The Fates,' and 'Liberty, Equality and Fraternity.' These pictures are peculiar in being nearly monochromatic, so planned, no doubt, because of the necessity of matching their tones and values with the surrounding white walls — for it was hardly hoped that the whole room could be enriched with color. On the other hand, the building on Madison Square, New York, appropriated to the State Supreme Court, Appellate Division, has its principal rooms and its hall of entrance adorned according to an elaborate general scheme, involving much variety of coloration and many large and fully realized paintings. These are by E. H. Blashfield, Henry Oliver Walker, Kenyon Cox, and many others. This building is also adorned as to its exterior with elaborate sculpture, statues, and high reliefs.

About 1880 was finished the remarkable painting which fills the eastern wall of the Church of the Ascension in New York city. This is the largest mural painting by LaFarge and one of the largest in America. Its subject is that from which the church is named, and the ascending Saviour is accompanied by a glory of angels, while a crowd of disciples watch from the earth below. The value of the picture is in its delicate and melting color, and the fact that this richness of hue and tone has in no way injured the wall as a part of the building. The picture does not count as a break in the solid structure, or as a window through which is seen the external world. The same artist painted in the Church of the Incarnation, the Church of Saint Thomas, and the Church of the Paulist Fathers, all in New York city. Robert Reid, of New York, has painted in the Church of the Paulist Fathers and in the Church of the Incarnation. At Bowdoin College, in Maine, the elegant little building occupied by the Walker Art Gallery has been decorated by certain paintings, of which those by Vedder and LaFarge are peculiarly important. Some very recent dwelling houses have received splendid mural decorations, among others two at least which have admirable ceilings by Will H. Low. One of these ceilings, in a round drawing-room at a corner of Fifth Avenue, is occupied by a circular picture, of which the subject, put into the title 'Golden Autumn,' is in reality a group of three draped female figures engaged in gleaning wheat from the field and winnowing in the simple old-fashioned way with a sieve.

About 1895 the Congressional Library in Washington was nearly completed, and was then put into the hands of Edward Pearce Casey, of New York, in order that he might administer the elaborate decorations proposed. This building was then adorned with mural paintings by a score of able men, and also by sculptures in the halls and stairs, in this last respect being almost alone in American public buildings. It may be noted here that sculpture has not been employed very freely in interior decoration in America. The great chimney-pieces of hall and library have been adorned with figures, even of life size; and the churches contain many tombs and memorial slabs to which relief sculpture adds a charm, but there is little more. The architect in charge of the Library was fortunately ready to improve his opportunities. The sculptures of Philip Martiny, carried out in a purely decorative way in the lower halls and the great stairs, are singularly appropriate to their place. They include bronze newel statues carrying torches which are fitted with electric lights, and long stretches of parapets very delicately carved with cupids and flowers. The sculptures of the late Olin H. Warner are few, but they are of singular importance, especially a pair of figures in high relief filling the spandrils of the archway leading to the great reading-room — figures of a young and an older student. Herbert Adams furnished a series of figures of about half life size carrying torches. But of all the sculptures of the interior by far the most important are the really surprising statues in the great reading-room, which forms a wide and lofty octagon. Here there are eight colossal symbolical statues worked into the architecture of the room — adorning the abutments of the great vaults — and these are by first-rate men, J. Q. A. Ward, Daniel C. French, Paul W. Bartlett, John Flanagan, and others. On the railing of the high tribunes forming a kind of second story to each recessed side of the octagon are ideal portrait statues of heroic size cast in bronze, and these, though placed too high for the best examination from below, and too distant from him who ascends the high tribune and looks across the rotunda, are still of such remarkable importance that they deserve minute study. Herodotus is by Daniel C. French; Bacon is by John J. Boyle; Patrick Henry is by Herbert Adams; Beethoven is by Theodore Baur; Fulton is by Edw. C. Potter; Shakespeare is by Frederick MacMonnies; Chancellor Kent is by George E. Bissell; Gibbon, the historian, is by Charles H. Niehaus; Michelan-

gelo is by Paul W. Bartlett. These 10 statues are of great interest, and casts and photographs of them should be within reach of everyone. The painting of this large building has been carried out with the most elaborate care, and it has been coupled by mosaics of ceilings and vaults, as well as of floors. On the ground floor there are long corridors which go off to the north and south, with their ceilings vaulted in [illegible] and pedentives; and the entrance hall itself, from which these corridors start, is divided by piers into a northern, a southern, and a western vestibule, each vaulted, with the vaults adorned in mosaic and the lunettes painted by Charles Sprague Pearce and H. O. Walker. Elihu Vedder has a special apartment behind the stair and leading to the great reading-room, stair and leading to the great reading-room; a lobby, which he has filled with allegorical paintings of Good Government, Bad Government, Anarchy, etc.; and near this a great wall mosaic, 'Minerva, the Protectress of Civilization.' Edward Simmons has one of the long corridors, in which he has filled 20 lunettes. The eye of the dome which crowns the great rotunda of the reading-room has a broad band carried around it filled with admirable symbolical figures by E. H. Blashfield. It is impossible to continue the examination of this vast collection of mural paintings, for this whole article might be devoted to it. A certain amount of blame has been thrown upon the building for its vividness of color, the constant play and change of contrasting effects; but it is the experience of every student of art who has given time to this strange gallery of art that its worth grows upon the student continually.

The public library of the city of Boston is alone in America in having a great mural painting by Puvis de Chavannes, the chief of modern decorative artists in color. And yet coloration is not the chief object of Puvis, whose work is too severely restrained by architectural considerations — is too honestly and frankly subordinated to the necessities of wall decoration, to be brilliant in color. What was said above about LaFarge's pictures in the Church of the Ascension is to be taken in singular contrast to what is said here about the great painting at the head of the stair in the Boston public library, for here warmth and brilliancy of color are eschewed, and the exquisite result bears out the great Frenchman in his choice of method. There are smaller panels by the same artist on the other walls of the staircase halls. The large room devoted to the giving out of books, in the second story of the library, is painted by Edwin A. Abbey. But here the result has been very different and in no way equally valuable. With the exception of Puvis' picture, the finest thing about the library, and the most important mural painting, probably, in America, is the Sargent at the south end of the hall in the third story, where the great staircase comes to an end. A painting at the north end of the hall was completed about 1895, and this excels in power, in magnificent sweep and force of workmanship, but it cannot compare with the painting at the south end in perfect fitness to the place and to its requirements. That picture at the south end of the room deals with the Christian faith as an established and accepted piece of ecclesiology and is divided into three chief parts, so that the whole wall at the end of the gallery, with no separation of the lunettes from the square wall below, is filled with the composition, superb in line and in color. The other walls of the same gallery are awaiting their decoration.

Some mural paintings of great importance date from the early years of the 20th century. Edwin H. Blashfield has painted, for the court-house of Baltimore, a picture 34 feet long and divided into three principal sections, to commemorate the surrender of his commission in the army by George Washington. For the same building Charles Y. Turner painted as a decoration 'The Barter with the Indians for Land in Southern Maryland,' and these two great pictures were completed in the autumn of 1902. Mr. Turner has now in hand another picture for the same court-house, 'The Burning of the Peggy Stewart at Annapolis in 1774,' this being one of the protests against the tax laws and in all respects equivalent to the famous Tea Party of Boston. For the same building Mr. Blashfield has completed (May 1904) 'The Edict of Toleration of 1649,' Lord Baltimore presenting his people to the personified virtues, Wisdom, Justice, and Mercy. For the Citizens' Bank of Cleveland, Ohio, Mr. Blashfield has completed a painting 27 feet long, symbolical of the uses of wealth. The State Capitol of Minnesota, in the city of Saint Paul, is to contain mural paintings by John LaFarge, Edward Simmons, H. O. Walker, Kenyon Cox, E. H. Blashfield, and Elmer Ellsworth Garnsey. There will also be paintings, framed and hung in the building, by Frank D. Millet and Douglas Volk.

RUSSELL STURGIS,

Decorations. See ORDERS AND DECORATIONS.

Decorative Plants. The plants used for decoration may be said to include not only species cultivated for purely ornamental purposes, but many others which have important uses. Thus the chestnut-tree, which in the forest is valued for its timber, might in a park have a distinct value for its pleasing form, attractive foliage, and long, graceful catkins. Similarly, the apple-tree when in flower can scarcely be rivaled as a lawn specimen. It is attractive also in its general form and when laden with red or yellow fruit. In the same way the common garden asparagus is a particularly ornamental plant, not only in itself, but to conceal the unsightly stems of such tall-growing plants as hollyhocks, or to act as the background for such brilliant flowering plants as scarlet sage (*Salvia splendens*). Even some of the weeds can be made to do signal decorative duty, as when a large-leaved dock is used to give tone to a group of otherwise characterless foliage, or when a mullin is allowed to rear its flowering stem like an exclamation point in a similar group. Thus it is evident that there is no fast line of demarkation between decorative and useful plants and kation between decorative and useful plants and useless plants, since the purpose for which the specimen is grown determines whether it is decorative or not.

But setting aside such utilitarian cases as forest and fruit trees, shrubs, vegetables, and weeds which may occasionally serve as ornamental subjects, decorative plants may be variously classified as to their place of growth, whether out of doors or under glass; as to their character of growth, whether trees, shrubs, vines, or herbs, etc.; as to their duration.


Digitalis purpurea.
Aesculus hippocastanum.
Evonymus europaea.
Eryngium alpinum.
Bougainvillea spectabilis.
Vriesea Wittmackiana.
Callistemon angustifolia.
Rhodoleia Championi
Melampyrum nemorosum.
Euphorbia splendens.
Warszewitzia coccinea.
Alloplectus peltatus.
Salvia sclarea.

whether annual, biennial, perennial, etc.; as to their attractive parts, foliage, flowers, fruit, bark, etc.; as to their season of special attractiveness; and in many other ways. For present discussion, however, the place where the plants are utilized and the kind of plants will be considered.

Unquestionably, trees constitute the most important group, since apart from any specially attractive individual feature they form the background or framework of all but the smallest garden pictures. In planting any place of considerable size, trees and their positions are always considered first; the shrubs, which bear a similar relation in small places, the perennial and annual herbs, being considered in the order given. Hence the choice and placing of trees deserves the most careful attention of the planter. Among the species attractive for their foliage and general form are the beeches, birches, lindens, cedars, pines, and spruces; and among those which bear conspicuous flowers are various magnolias, the hardy catalpas, especially *C. speciosa,* which attains a large size and bears large leaves and a profusion of big, white blossoms. The horse-chestnut (*Æsculus hippocastanum*), with its large panicles of white flowers tipped with red, often attains 50 feet in height and is very popular as a lawn and street tree because it casts a dense shade. Other popular flowering species are *Paulownia,* tulip-tree (*Liriodendron*), golden chain (*Laburnum*), and locust (*Robinia*). Of the tender exotic trees which are cultivated only in warmer climates, perhaps few surpass the *Rhodoleia,* a small southeastern Asiatic tree with evergreen leaves and heads of four or five bright pink camellia-like flowers.

Prominently in front of the trees, or upon the margins of ponds in which their beauties may be reflected, the foliaceous and flowering shrubs may be placed in groups or singly. There is a vast list of these, especially of the blossoming kinds, but such as are perfectly hardy in any locality will usually be most satisfactory, since they need less attention as a general rule than specimens that must be coddled. Among the generally admired foliaceous species, the dwarf pines, spruces, and other conifers, willows, maples — especially the Japanese varieties — are perhaps most frequently planted; and among the flowering kinds, the barberry (*Berberis*), dogwoods (*Cornus*), spindle-tree (*Euonymus*), *Deutzia, Forsythia, Hydrangea,* lilac, *Rhododendron,* and *Spiræa* are general favorites of easy culture. In southern Florida and in parts of California many exotic species have been introduced. One popular shrub is the bottle-brush (*Callistemon*), an Australian evergreen with dense cylindrical spikes of usually red flowers. Some of these tender species are grown in greenhouses in cool climates, as are also various species of *Alloplectus,* tender tropical evergreens with yellowish tubular flowers.

Among the shrubs, partially disclosed and yet seemingly hidden, may be displayed the hardy perennials, such as *Yucca,* with its spire of creamy white blossoms which brighten sombre nooks, or the plume-poppy (*Bocconia cordata*), whose feathery panicles add airiness to rather heavy masses of foliage. Certain hardy perennials are, however, often planted in borders, for which purpose larkspur (*Delphinum*), foxglove (*Digitalis*), *Pentstemon,* sea-holly (*Eryngium*), peony, and the spiræas are general favorites.

In the South, in California, and in northern greenhouses there is probably no vine so easily grown and so generally satisfactory as the *Bougainvillea.* The flowers are small and insignificant, but the large bract which subtends each blossom is usually bright red or purple. Since the plant quickly covers large areas and is very floriferous, it forms a brilliant covering which continues attractive often for months. It is largely used for training over arbors and piazzas in warm climates. Another popular climber of the same class (tropical) is the crab's-eye vine (*Abrus precatorius*), which grows about 10 feet tall, bears white, pink, or rose-colored flowers, and bright scarlet seeds, each with a black spot. It is often called weather-plant from its supposed powers of indicating the future state of the weather.

Among the host of plants grown under glass, one of the most striking is the gigantic Abyssinian banana (*Musa ensete*) with paddle-shaped leaves often 12 feet long by 3 feet broad, and with leaf stems as thick as a man's fist. Another noticeable though rather insignificant-looking plant is the fragrant olive (*Olea fragrans*) with a profusion of deliciously perfumed tiny cream-colored flowers. Probably the most important group consists of the palms which are so popular as pot and tub plants in decorations at church festivals, social functions, etc., and some of the smaller species of which, especially *Cocos weddeliana,* are largely used in table adornment. There are also many plants, such as *Coleus vriesia, Dieffenbachia,* and the ferns which are specially attractive for their odd or graceful foliage. The orchids, such as *Cattleya, Lælia, Dendrobium, Cypripedium, Odontoglossum,* and many others are grown for their flowers, their foliage being usually unattractive. Several species of *Euphorbia* are very popular, one, generally known as "poinsettia," being widely used for the whorl of scarlet leaves surrounding the insignificant greenish flowers, while another (*E. splendens*), known as "crown of thorns," is grown more because of its oddity and on account of the legend as to its use in the persecution of Jesus than because of its intrinsic beauty. This legend is also connected with several other spiny plants. The most important species mentioned above will be found discussed either under their popular or generic names. See also Floriculture; Forestry; Horticulture; Landscape Gardening.

De Cos'ta, Benjamin Franklin, American clergyman and writer: b. Charlestown, Mass., 10 July 1831; d. New York 4 Nov. 1904. He entered the ministry of the Episcopal Church and was rector of the Church of St. John the Evangelist in New York 1863–99. In the year last named he became a Roman Catholic. Included in his many publications are: 'The Pre-Columbian Discovery of America by the Northmen' (1869); 'The Moabite Stone' (1870); 'The Rector of Roxburgh,' a novel under the pen-name of William Hickling (1873); 'Verrazano the Explorer' (1880); and 'Whither Goest Thou?' (1902). He became president (1884) of the first branch of the White Cross Society, of which he was the organizer.

De Coster, Charles Théodore Henri, shärl tā-ō-dōr' ānrē dē kōs'ta, Belgian poet: b. Munich 20 Aug. 1827; d. 7 May 1879. His first poetical composition was 'The Owls' Mirror'; then followed 'Flemish Legends' (1850); 'Brabant Stories' (1861), a spirited description of Jewish life; 'The Wedding Tour' (1872); and the little comedy 'Jenny' (1865).

Decourcelle, Pierre, pē-ār' dē-koor-sĕl', French dramatist: b. Paris 25 Jan. 1850. His first work was the five-act drama 'The Ace of Clubs,' written for Sara Bernhardt, which had an extraordinary success. Then followed a succession of comedies, dramas, comic-opera libretti, and dramatizations of popular novels, written by him individually or in collaboration with other authors; among them: 'The Amazon' (1885); 'Madame Cartridge'; 'The Abbé Constantin' (founded on Halévy's story); 'The Man with the Broken Ear' (after About). He wrote also a sensational novel, 'The Gray Hat' (1887), and 'Fanfan' (1889), both of which were received with great popular favor.

Decoy, a place into which wild fowl are decoyed in order to be caught. A decoy pond is kept only in a secluded situation. Several channels or pipes of a curved form, covered with light hooped net-work, lead from the pond in various directions. The wild fowl are enticed to enter the wide mouth of the channel by tamed ducks, also called decoys, trained for the purpose, or by grain scattered on the water. When they are well into the covered channel they are surprised by the decoy-man and his dog, and driven up into the funnel net at the far end, where they are easily caught. There are differences of detail, but the general features of decoys are the same.

Decree, in general, an order, edict, or law made by a superior as a rule to govern inferiors. In law it is a judicial decision or determination of a litigated cause. The decree of a court of equity or admiralty answers to the judgment of a court of common law. In ancient history it signified a determination or judgment of the Roman emperor on a suit between parties. In the former German empire the resolutions of the emperor, declared to the estates of the empire, were called decrees. The old name of royal orders in France was *ordonnances* or *lettres*. The national convention, while it possessed sovereign power, used the expression, *La convention nationale décrète:* but the imperial government used the words imperial decree, for instance, in the famous decrees of Berlin and of Milan. In ecclesiastical history the term is especially used with reference to the authoritative decisions of councils. See BERLIN DECREE; MILAN DECREE.

Decrepita'tion, the crackling noise which several salts make when suddenly heated, accompanied by a violent exfoliation of their particles, due to the sudden conversion into steam of the water which is mechanically enclosed between the solid particles of the body; or to the unequal expansion of the laminæ of which the mineral is composed in consequence of their being imperfect conductors of heat. The true cleavage of minerals may be often detected in this way, for they fly asunder at their natural fissures.

Decre'tals, The (*Decretales*), (1) the second part of the Canon Law or *Corpus Juris Canonici* (q.v.). It contains in five books the papal constitutions, laws, and decisions from the time of Gratian's *Decretum*, 1151 to 1234, when this second part was compiled by St. Raymond of Pennafort at the order of Gregory IX. The subject matter of each of the five books is expressed in the mnemonic hexameter verse:

Judicium, judex, clerus, connubia, crimea;

meaning that the decretals of the first book relate to the constitution of tribunals, those of the second to the duties of judges, those of the third to the rights, privileges, etc., of the clergy, those of the fourth to marriage, and those of the fifth to offenses against the Church's laws.

(2) *The False Decretals*, or the *Pseudo-Isidorian Decretals* are a collection of decretals, gathered ostensibly by Isidorus Mercator, in the middle of the 9th century. The exact date and authorship of the document are not known; but as a canon of the Council of Paris (829) is quoted, the collection must have been made later than the year in which the council was held. Some modern historians claim that the collection was well known before the year 845. Rheims and Mayence are each given as the place where the work of collating and writing was done. The writer called himself Isidore Mercator, and in some MSS. "Peccator." (The writer may have had in mind the great St. Isidore, who had previously made a compilation of decrees and canons.) Historians claim that the name was, like the decretals, false. The collection was received at first as authentic. To have at hand and in convenient form all the decrees of councils and the decretal letters of deceased popes, was indeed a boon to be highly appreciated. It was known that letters and documents existed other than those to be found in any collection, so when this collection made its appearance, it was regarded as worthy of praise and thanks.

The collection opened with the 50 apostolic canons received and collected by Dionysius Exiguus; and these were followed by a number of decretal letters said to have been written by early popes, from Clement of Rome, one of the apostolic fathers, to Melchiades, at the end of the 3d century. None of the letters claimed to have been written by popes are genuine. Decrees purporting to have been promulgated at the councils of Nicæa and Seville, came next. Some of these are true. Then came other letters said to have been written by popes, beginning with Sylvester (who succeeded Melchiades) and ending with Gregory the Great. One letter in this collection, credited to Pope Siricus (384–399), is genuine. The last part of the compilation is a copy of the canons passed by Gregory II. (731) at the council held in Rome. Möhler, the German theologian, in commenting upon the fact that these decretals were at first so well received, almost without a dissenting voice, says: "Pseudo-Isidore seized exactly that in his own age which corresponded to the wishes of all the higher and better order of men. Thence it was that this legislation was so joyfully received. No one suspected anything false, because it contained so much that was weighty and true. If we examine carefully these invented decretals, and try to characterize their composer in accordance with their general import and spirit, we must confess that he was a very learned man, perhaps the most learned man of his time, and at the same time an ex-

tremely intelligent and wise man, who knew his age and its wants as few did. Rightly he perceived that he must exalt the power of the centre — that is, of the Pope — because by that way only was deliverance possible. Nay, if we would pass an unconstrained judgment, we may venture even to call him a great man."

At the time of the appearance of the collection and for centuries afterward, its contents were so in harmony with the leading thought of Europe that the whole was accepted without thorough examination or criticism. Nicholas of Cusa, an able theologian of the 15th century, was the first one to express a doubt of the genuineness of the collection, and to advance proofs of the truth of his assertion. The Magdeburg Centuriators began investigations, and then many Protestant critics followed the same line of study, arriving at the same conclusion as that of Nicholas of Cusa. Finally, when the Isidore decretals were examined critically by theologians and historians, it was ascertained that nearly all were forgeries, and that anachronisms and blunders existed in large numbers. Phillips, Hefele, Möhler, and others show that in the whole collection there was nothing against the supremacy of the Pope, as had been advanced by some writers; that the letters said to have been written by popes were nearly all false, also that several of the spurious documents existed prior to the 9th century and may have been used in good faith by the compiler.

Consult: Hefele; Paulus Hinschius, 'Decretales Pseudo-Isidorianæ'; Dumont; Mohler; Phillips; Knust; Rosshirt; Walter; Spittler; Wasserschleber; the brothers Ballerni.

Decu'riones, magistrates in the provincial *municipia* of the Roman state, corresponding to the senate at Rome. Originally the popular assemblies had the sovereign power in the *municipia,* and conferred the executive authority upon the decuriones. They consisted at first of 10 men, but in later times they frequently numbered more, and sometimes even amounted to 100. Each *curia decurionum* was presided over by two members who were called *duumviri,* and whose powers within their *municipium* resembled those of the Roman consuls during peace. Under the republic the whole administration of the internal affairs of their respective cities was in the hands of the decuriones, but after the establishment of the empire they exercised nearly all the circumscribed rights of the communities, though finally they were little more than receivers of taxes. The decuriones were created by election, and each decurio was required to be at least 25 years old, and to possess a certain annual income. Their election took place on the kalends of March.

Dedekind, Friedrich, frēd'rĭH dā'dē-kĭnt, German poet: b. Neustadt on the Leine 1525; d. 27 Feb. 1598. His principal work is 'Grobianus' (1549), a satire in Latin distichs against drunkenness and obscenity; it had wide circulation, and was translated into German, Dutch, and English. He wrote two dramas having a religious polemic end in view: 'The Christian Knight'; and 'The Converted Papist.'

Dedham, Mass., town, county-seat of Norfolk County; on the Charles River about 25 miles from its mouth, and on the New York, New Haven & Hartford Railroad. The town is one of the oldest in the State, the first settlement within the town's limits having been made in 1635. The town is noted as having established the first public school in America supported by a general tax (1644). It has considerable manufacturing interests in cotton, wool, and clay, but its chief interests are connected with Boston, of which it is practically a suburb. Pop. (1900) 7,457. Consult: The town records; Man, 'Historical Annals of Dedham.'

Dedlock, Lady, the wife of Sir Leicester Dedlock, in Dickens' novel called 'Bleak House.' Outwardly cold and haughty, she is inwardly wretched in consequence of being haunted by recollections of her past life, and by fear that the existence of her illegitimate child, Esther Summerson, will be revealed. Lady Dedlock dies at the cemetery where her former lover is buried.

Deduction (Lat. *deducere,* to take away, to draw out), in logic, as opposed to induction, is the method of reasoning from generals to particulars, as the latter is from particulars to generals. Induction is the mode by which all the materials of knowledge are brought to the mind and analyzed; deduction, the process by which the knowledge thus acquired is utilized, and by which new and more complicated inductions are rendered possible. Thus every step in a deduction is also an induction.

Dee, John, English astrologer: b. London 13 July 1527; d. Mortlake, England, 1608. In early life he had devoted much of his time to mathematical, astronomical, and chemical studies; and in 1548 rumors began to prevail that he was addicted to the black art. They were probably well founded; and to avoid the consequences he went abroad. In 1551 he returned to England and through the instrumentality of Cecil, who presented him to Edward VI., obtained a pension of 100 crowns. The suspicion of the black art appears still to have clung to him, and shortly after Queen Mary's accession he was charged with practising against the queen's life by enchantment, and imprisoned. He obtained his liberty in 1555, and after Queen Elizabeth's accession was consulted by Lord Dudley as to "a propitious day" for the coronation. Lilly's account of him is that he was the queen's intelligencer, with a fixed salary; a great investigator of the more secret hermetical learning, a perfect astronomer, a curious astrologer, a serious geometrician, and excellent in all kinds of learning. The nature of his employments excited strong suspicion, and in 1576 he was furiously attacked by a mob, from which he had difficulty in escaping with his life. In 1578, during an illness of the queen, he was sent to consult with the German physicians and philosophers as to her recovery, and after his return was employed to draw up a sketch of the countries which, from having been discovered by English subjects, belonged to the crown. He accordingly prepared two rolls, giving both a geographical description and a historical account of the countries. These curious documents are still extant in the British Museum. After many wanderings, Dee, returning home, obtained from the queen in 1595, the wardenship of Manchester College, which he held nine years. It has been supposed, with some plausibility, that Dee's character as an alchemist was merely assumed to enable him to act more securely and effectually as a spy in the employment of the English government.

Dee, the name of several British rivers. 1. A river in Scotland, partly in Kincardineshire, but chiefly in Aberdeenshire, one of the best salmon rivers in Great Britain. It rises on the southwest border of Aberdeenshire, and flows generally east, 87 miles to the German Ocean. The city of Aberdeen is at its mouth. 2. A river of North Wales and Cheshire; rises in Lake Bala, Merionethshire; flows north-northeast and northwest to the Irish Sea, 20 miles below Chester; length, about 80 miles. 3. A river of Scotland, county of Kirkcudbright, rises in Loch Dee. It flows southeast and south into Kirkcudbright Bay; length, 38 miles.

Deed, a written instrument under seal, containing a contract or agreement which has been delivered by the party to be bound and accepted by the obligee or covenantee. It has also been defined as follows: "A writing containing a contract sealed and delivered by the party thereto." (2 Wash. Real Prop. 553.) The law requires greater form and solemnity in the conveyance of land, than in that of chattels. This arises from the greater dignity of the freehold in the eye of the ancient law, and from the light and transitory nature of personal property, which enters much more deeply into commerce, and requires the utmost facility in its incessant circulation.

In the early period of English history the conveyance of land was ordinarily without writing, but it was accompanied with overt acts, equivalent, in point of formality and certainty, to deeds. As knowledge increased, conveyance by writing became more prevalent and ultimately by the statute of frauds and perjuries, of 29 Charles II., Ch. 3, secs. 1, 2, all estates and interests in lands (except leases not exceeding three years) created, granted, or assigned, by livery of seisin only, or by parol, and not in writing, and signed by the party, were declared to have no greater force or effect than estates at will only. And by the fourth section no person could be charged upon any "contract or sale of lands, or any interest in or concerning the same," unless the agreement or some memorandum or note thereof, was in writing, and signed by the party to be charged therewith, or some other person by him lawfully authorized.

With some trivial changes this statute provision has been adopted or assumed as law throughout the United States. Deeds must be upon paper or parchment, must be completely written before delivery, must be between competent parties, and certain classes are excluded from holding lands, and, consequently from being grantees in a deed; must be made without restraint; must relate to suitable property, and should be signed, sealed, and delivered. The consideration of a deed must be good or valuable and not partaking of anything immoral, illegal, or fraudulent.

A deed should be delivered and accepted. A delivery is the transfer of a deed from the grantor to the grantee, or some other person acting in his behalf, in such a manner as to deprive the grantor of the right to recall it at his option. An absolute delivery is one which is complete upon the actual transfer of the instrument from the possession of the grantor. A conditional delivery is one which passes the deed from the possession of the grantor, but is not to be completed by possession in the grantee, or a third person as his agent, until the happening of a specified event. A deed delivered in this manner is an *escrow*, and such delivery should be always made to a third person. No particular form of procedure is required to effect a delivery. It may be by acts merely, by words merely, or by both combined, but in all cases an intention that it shall be a delivery must exist. It may be made by an agent as well as by the grantee himself. To complete a delivery, an acceptance must take place, which may be presumed from the grantee's possession. In a deed the premises embrace the statement of the parties, the consideration, recitals inserted for explanation, description of the property granted, with the intended exceptions. The *habendum* begins at the words "to have and to hold," and limits and defines the estate which the grantee is to have. The *reddendum*, which is used to reserve something to the grantor; the conditions; the covenants; and the conclusion which mentions the execution date, etc., constitute the formal parts of a deed and properly follow in the order observed here. The construction of deeds is favorable to their validity; the principal includes the incident; punctuation is not regarded; a false description does not harm; the construction is least favorable to the party making the conveyance or reservation; the *habendum* is rejected if repugnant to the rest of the deed. The *lex rei sitæ* governs in the conveyance of lands, both as to the requisites and the forms of conveyances.

Chancellor Kent, after observing that in the United States generally the form of conveyance is very simple, says: "I apprehend that a deed would be perfectly competent, in any part of the United States, to convey the fee if it was to the following effect: 'I, A. B., in consideration of one dollar to me paid by C. D. do grant, bargain and sell to C. D. and his heirs, the lot of land (describe it), witness my hand and seal, etc.'"

Deeg, dēg, India, town and dismantled fortress in Rajputana, state of Bhurtpore, 24 miles west of Muttra. It is situated in the midst of marshes, and almost surrounded by water during a great part of the year. At the southwest corner is the lofty rock of the Shah Boorj, on which the citadel stands. Deeg is a place of great antiquity, and contains a remarkably fine palace, only surpassed in beauty by the Taj Mahal of Agra. Holkar was defeated here by the British under Gen. Fraser in November 1804, and the following month the town and fortress were taken. Pop. 16,000.

Deems, Charles Force, American clergyman and writer; b. Baltimore, Md., 4 Dec. 1820; d. New York 18 Nov. 1893. From 1866 to his death he was pastor of the Church of the Strangers of New York, and was widely known as editor and author. Included in his publications are: 'Triumph of Peace and Other Poems' (1840); 'The Light of the Nations' (1870); 'Weights and Wings' (1872); 'Chips and Chunks for Every Fireside'; and 'My Septuagint' (1892).

Deemster, an officer once attached to the high court of justiciary in Scotland, who formally pronounced the doom or sentence of death on condemned criminals. The office was conjoined with that of executioner. The name is now given in the Isle of Man to two judges who

act as the chief justices of the island, the one presiding over the north, the other over the south division.

Deemster, The, a novel by Hall Caine, called by the author the story of the Prodigal Son. It was published in 1877. The scene was laid in the Isle of Man, and opens in the latter part of the 17th century. The Deemster is Thorkell Mylrea, whose nephew Dan, the prodigal, deeply loves his cousin Myra; but her brother Ewan interferes and a duel ensues, resulting in the death of Ewan. Dan is tried and is declared cut off forever from his people, and banished to a remote corner of the island. During a visitation of the plague, Dan takes the place of Father Dalby, the Irish priest, effecting many cures and at last dying of the pestilence. A dramatization of 'The Deemster' was produced by Wilson Barrett under the title 'Ben-Ma-Chree.'

Deep Bottom, Va., Battles at. 1. On 25 July 1864, Gen. Grant, then besieging Petersburg, ordered a movement, the principal object of which was to threaten Richmond and draw as many of Lee's troops as possible from the lines in front of Petersburg, so as to give promise of success in asaulting them, upon the springing of a mine prepared by Gen. Burnside. Deep Bottom is opposite a great bend of James River, making a neck of land known as Jones' Neck, at a point where Bailey's Creek flows into the James from the north. Butler's pontoon bridges, one below and one above the mouth of the creek, were held by Gen. R. S. Foster with a brigade of the Tenth corps. The Confederates were entrenched on the west side of the mouth of the creek in Foster's front. About 2 A.M. of the 27th, Hancock began crossing the James by the lower bridge, to turn the Confederate left, while Foster attacked the right. At daylight all moved forward. Gen. Nelson A. Miles' brigade drove the Confederates from their position on the New Market road, east of the creek, and captured a battery of heavy guns, but progress across the creek was barred. From the river to Fussell's Mill, a distance of about two miles, its west bank was held by Kershaw's and Wilcox's divisions, joined during the day by Heth's division. On the morning of the 28th, Kershaw advanced on the Charles City road and drove Sheridan back over a ridge upon which he was posted; but Sheridan, dismounting his men, drove Kershaw back in some confusion, taking 200 prisoners and two colors. Reinforcements arrived until five eighths of Lee's army was now north of the James. Grant wanted no assault made, and on the 29th Hancock and Sheridan recrossed the James. The Union loss in this movement was 334 killed and wounded.

2. Gen. Grant, on 12 August, ordered another movement on the north side of the James to threaten Richmond. Hancock's Second corps, part of the Tenth corps, under Gen. Birney, and Gen. Gregg's division of cavalry, were designated for the purpose. Birney's command was at and near Deep Bottom; the cavalry and artillery went by land, as in July; and Hancock's corps marched to City Point and took steamers for Deep Bottom, 16 miles up the river, where it was landed on the morning of 14 August. Mott's division was to advance on the New Market road and drive the Confederates into their works beyond Bailey's Creek, while Barlow, with his own division and Gibbons', was to move on Mott's right, and assault the line near Fussell's Mill. Gregg's cavalry was to cover Barlow's right, and when the infantry uncovered the Charles City and Darby roads, was to make a dash on Richmond, if opportunity offered, and if not, to destroy the railroads entering it. Birney was to attack the Confederate right, and, if successful, move up the river roads on Chaffin's Bluff. Field's Confederate division held Bailey's Creek and Wilcox's division was at Chaffin's Bluff. At the first intimation of Hancock's movement Wilcox moved up and joined Field, and from the south side of the James Gen. Lee sent Mahone's division of infantry and the two cavalry divisions of Wade Hampton and W. H. F. Lee. Johnson's and Gary's brigades followed, and there were three regiments from Pickett's division. Mott advanced on the New Market road, but was checked at the creek. It was 4 o'clock before Barlow, on his right could get up one brigade, and with this he assaulted the position near Fussell's, was repulsed, and rested for the night. On the right Gregg had advanced well up the Charles City road, and on the left Birney seized a part of the Confederate line and captured three guns. On the morning of the 15th Birney's corps and a brigade of Mott's division endeavored to turn the Confederate left. Birney moved toward the Charles City road, on which Gregg was advancing, but he made so wide a detour and found so many obstructions, that it was night when he found his proper position, and attack was deferred until morning. As a diversion to his attack Gregg's cavalry, supported by Miles' brigade of infantry, were to move up the Charles City road. Gregg was off at an early hour of the 16th, driving the Confederate cavalry beyond Deep Creek, as far as White's Tavern, only seven miles from Richmond. At 10 A.M. Terry's division of Birney's corps, supported by Craig's brigade of Mott's division, and Birney's brigade of colored troops, advanced against the Confederate line near Fussell's Mill, and, after a severe fight, carried it, taking three colors and between 200 and 300 prisoners from Mahone's and Wilcox's divisions; but the Confederates soon rallied, retook their works, and drove Terry back. Soon after noon the Confederate cavalry, supported by infantry, advanced on Gregg and Miles, slowly driving them back to Deep Creek, and later in the day across it. There was a cessation of hostilities on the 17th. On the 18th the Confederates advanced from their works above Fussell's Mill and attacked Birney, who, with the assistance of Miles, repulsed them. On the night of the 20th the Union troops were withdrawn and returned to their positions in front of Petersburg and at Bermuda Hundred. In this battle the Union troops numbered about 28,000, the Confederates about 20,000. The Union loss was 2,161 killed and wounded, and 625 missing. There are no returns of Confederate losses. Consult: 'Official Records,' Vol. XLII.; Humphreys, 'Virginia Campaign of 1864–5'; Grant, 'Personal Memoirs,' Vol. II.; Sheridan, 'Personal Memoirs,' Vol. I.; Walker, 'History of the Second Army Corps.'

E. A. CARMAN.

Deep River rises in Guilford County, N. C. Its general direction is southeast to Chatham County, where it unites with the Haw River and forms the Cape Fear River. Its

[illegible] 125 miles; it has good water power, [illegible] which is utilized at Lockville.

Deep-sea Exploration. The exploration of ocean depths dates from 1807, when Pourtales and Maitland, officers of the United States Coast Survey, engaged in systematic sounding and dredging in the Straits of Florida. From 1868 to 1872 a similar work was undertaken by Wyville Thomson, carpenter, and George Jeffries, in British vessels, sounding the Mediterranean and North Atlantic. Beginning in December 1872, and continuing until the spring of 1876, the Challenger, a British ship, under Nares and Thomson, made a tour of the world, taking soundings and dredging from 362 stations. France and Norway sent out expeditions for a like purpose at a later date. The Prince of Monaco also took great interest and did much sounding from his yacht, bringing up fish from a depth of two miles. Excepting the successful and complete work of the Challenger, most of the exploration valuable to science has been done by the United States, the Bibb making a tour in 1878–79, and the Blake doing continuous duty in this field from 1877 to 1880, under the co-operation of Agassiz, Sigsbee, and Bartlett, while the United States fish commission vessels, Albatross and Fishhawk, engaged in lengthy exploration under Baird, Belknap, Tanner, etc.

The average depth of the ocean is now known to be about $2\frac{1}{2}$ statute miles. Its floor has a contour very similar to that of the land, there being vast levels or plains, ravines, gorges, ridges and mountains that rise into islands, and deeps that fall farther below the sea-level than the topmost peaks of the Himalayas rise above that level. Light penetrates about 100 fathoms, or in specially clear water, under the direct rays of a tropical sun, to perhaps nearly 200 fathoms, and below it is all dark, except for the phosphorescence of some of the deep-sea inhabitants. The depths are also cold, approaching the freezing point in all latitudes. The cold waters from the frozen poles flow in slow currents along the bottom, over the dead marine organisms that strew the greater portion of the ocean floors, down to the deepest regions, where the bottom is of red clay of Tertiary formation.

The 100-fathom depth to which light penetrates has been termed the littoral region, and within this grow marine algæ, and the animals that feed upon them. The depths below 1,000 fathoms have been termed the benthal area, while the area between 100 and 1,000 fathoms has been termed the abyssal area. The slopes along the edges of the continents, extending roughly 200 miles from land, constitute the region of terrigenous deposits, the sea bottom being composed more or less of the washings carried down by the great rivers that drain the continents. Besides the washings, which partake of the nature of the adjoining land, this region contains green coral, and volcanic mud. Beyond the influence of the shore washings comes the region of pelagic deposits, the ocean floor being strewn with dead marine organisms that have sunk from the littoral region.

The immense pressures of the great deeps below 3,000 or 4,000 fathoms are probably accountable for the fact that the dead organisms (so common to higher regions) are not found, but apparently dissolve and float away in the currents. The deepest holes have a bottom of red clay that appears to have undergone no material change since the Tertiary Period.

Since there are no algæ below the littoral region, it follows that all the marine animals below are carnivorous. None of these are ever brought up alive, since, if alive when netted, they succumb to the expansion that results from their being brought up to the surface where the pressure is so much below what they are constructed to reside in. The sea pressures are enormous, increasing from 15 pounds per square inch at the surface to a ton per square inch at a depth of 1,000 fathoms. The fish brought up from a depth of 3,000 fathoms are therefore subject to a surrounding pressure of three tons per inch of surface, a pressure that would be dangerous to a high-grade steel boiler. The deep-sea fishes do not succumb to it, because their tissues are porous, and the fluids of their bodies are of a like pressure with their surroundings. This maintains a balance that subjects them to no more strain than would a solid shot receive by being immersed at the same pressure. The bones of these fishes, instead of being built heavy to withstand a crushing pressure, are made fibrous and full of porosities, and include scarcely any calcareous matter. When these fish are brought to the surface their joints and muscles are found to be very loosely connected, and they have to be handled very carefully. Some of them are sure to break up with the least handling, as the *Plagiodus* of the Madeiran Sea. The deep-sea fishes universally are provided with air-bladders, and these of course tend to expand as the fish are brought up. Probably they could be brought up alive, if the speed of raising them were very slow. There are many deep-sea fishes that live at or near the surface when quite young, and go deeper as they advance in age. Nearly all the deep-sea fishes are classified among the same families as the fishes familiar on the surface, but the *Alepocephalidæ* and *Halosauridæ* are found only in the depths.

At a depth of 400 fathoms the *Gobiidæ*, *Blenniidæ*, *Percidæ*, *Scorpænidæ*, *Trichiuridæ*, *Cottoidæ*, *Cataphracti*, *Bathythrissidæ*, and most of the *Trachinidæ* cease to exist. At a depth of 500 fathoms the sharks, rays, and flatfish are no longer found. At a depth of 700 fathoms the *Cottoidæ*, *Discoboli*, *Zoarcidæ*, etc., disappear. The limit of the *Holocephali* is about 1,200 fathoms. The families commonly found at the greatest depths, 2,500 fathoms and under, are the *Berycidæ*, *Ophidiidæ*, *Pediculati*, *Macruridæ*, *Sternoptychidæ*, *Scopelidæ*, *Stomiatidæ*, and *Muræniidæ*.

Both the number and variety of fish decrease as depths increase, as the vast body of marine animals prefer to live near the surface.

The phosphorescent fishes are mostly characterized by luminous organs, which present all sorts of modifications as to location, appearance, and structure. Some of them are luminous all over when in motion and non-luminous when at rest, the brightness being occasioned by a luminous secretion emitted when the creature is active. Some of the deep-sea creatures are blind, others see by phosphorescent light, which they or other organisms emit. The fishes in the very great depths have small eyes, while those of moderate depths have large optical organs. Many deep-sea animals have highly developed feelers; the coloration of others is extremely

DEEP-SEA LIFE.



1. Pheronema Carpenteri. 2. Hyalonema Sieboldii. 3. Semperella Schultzei. 4. Dactylocalyx pumiceus. 5. Sclerothamnus Clausii. 6. Chondrocladia virgata. 7. Actinotheca pellucida. 8. Pectanthis asteroides. 9. Drymonema Victoria. 10. Ypsilothuria attenuata. 11. Rhopalodina Heurteli. 12. Oneirophanta mutabilis. 13. Euphronides Talismani. 14. Peniagone rosea. 15. Psychropotes buglossa. 16. Styracaster spinosus. 17. Hymenaster rex. 18. Arcturus Baffini. 19. Nematocarcinus gracilipes. 20. Colossendeis Titan. 21. Nymphon robustum. 22. Boltenia pedunculata. 23. Eustomias obscurus. 24. Eurypharynx pelecanoides. 25. Halosaurus macrochir. 26. Neostoma bathyphilum. 27. Macrurus globiceps. 28. Melanocetus Johnstoni. 29. Stomias boa.

brilliant, yellows, reds, greens, and purples being dominant colors, while there is a strange absence of blue. The fishes are mostly dark-colored, while the crustaceans, holothurians and starfish are the most brilliant, the colors being often in large patches of striking contrast. No deep-sea fishes above about five feet in length have been taken. This is not regarded as evidence that they do not grow longer, the fact that the mouths of the largest beam-trawls in use are only about 11 by 2 or 3 feet probably having something to do with the matter.

The dredge or beam-trawl commonly used is a form of big bag-net, of 20 to 25 feet in length, that is weighted and dragged along the bottom. As many as 800 fishes have been brought up in a single haul with such a dredge, from a depth of 1,770 fathoms, in Bering Sea. Four or five hours are required to dredge at such a depth. The deepest haul on record at which animal life was obtained was made by the Albatross of the United States Fish Commission, near the Tonga Islands, the depth being 4,173 fathoms. Ten hours elapsed from the time the dredge went overboard till it was brought again to the deck.

The tangle is a device used for bringing up specimens of fauna or anything it can catch. This consists of an iron bent in the form of an inverted V and having frayed rope attached to it. During recent years gill-nets have been used at a depth of a mile, and traps and trawl-lines have also been sunk to considerable depths.

The first reliable sounding at a great depth is credited to Capt. Sir James Clark Ross, who in 1840 sounded 2,677 fathoms on the west coast of Africa. Subsequent soundings were reported as deep as 7,000 fathoms, but as these were made with the old-fashioned clumsy apparatus that tended to drift tremendously, and as they do not agree with modern soundings, they are not credited. In 1854 J. M. Brooke of the United States navy, suggested the employment of a dropped weight in deep-sea sounding, and this was found to assist matters so much that it has remained in use ever since. The first attempts to substitute wire for rope were not very satisfactory, owing to the too great thickness and weight of the wire used. When steel piano-wire of great tensile strength was brought into use and weighted with a 60-pound shot, arranged to be dropped, it was found that the soundings were made with a close approach to accuracy, and at much greater speed in much less time than before.

In 1872 there was invented the cylinder sounding machine in which a cannon-ball was used for the sinker, the ball having a hole bored through it, in which was placed a metal tube or small cylinder. When the weight descended into the muddy bottom, the tube was filled with mud, and a device closed it, at the same time releasing the ball. Another device originated later consists of two hemispherical cups, normally hinged so as to be apart. When the weight strikes the bottom it brings the cups together, so that they grasp whatever is in the way. The wire used in soundings weighs about 14 pounds to the mile, and very ingenious reeling-machines have been devised for handling it. The first difficulty to be overcome was the roll of the ship, which tended to jerk the line. This is compensated for, and a friction device is adjustable so as to balance the weight of wire, etc., that is out. Elastic appliances, called accumulators, were devised by C. D. Sigsbee of the United States navy, and these have made it possible to employ steam power in paying out and reeling in the line.

The testing of deep-sea currents is done with the current-meter, the accepted form of which is hung on a wheeled traveler from the line sent down. A screw-propeller-like device rotates with the current, and there is a contrivance for registering the number of revolutions, from which registration the speed can be computed. The older devices, which were less satisfactory, depended upon the differential motion of surface floats to note the difference between upper and lower currents.

When it was first endeavored to take temperatures by thermometers at considerable depths it was found that the results were erroneous, apparently because of the increased pressure. Miller and Cassella invented a double thermometer that partially overcame the difficulty, but it served to register only the maximum and minimum temperatures. Negretti and Zambra improved on this, arranging the thermometer in reversed position while descending, and bringing it back to proper position at the depth of the test. The turn resulted in separating the column of mercury above the bulb, and the correct temperature could be indicated.

A most ingenious apparatus for reading the temperature of a descending sounding apparatus from the deck of a vessel has been designed by Sir William Siemens. He secures the temperature on the Wheatstone bridge principle, by the electric resistance of a conductor. A copper vessel of water is heated or cooled until the bridge balances, and the temperature of the water in the vessel is then the same as that below. The apparatus is unfortunately too delicate for ordinary use. All instruments sent down into the depths have to be protected against the pressure, their strength being proportioned to the depths to which they are to be used.

The deepest sounding made up to 1876 was that of the Tuscarora, of the United States Fish Commission, which reached 4,655 fathoms off the coast of Japan, in 1874. The Challenger's deepest sounding was also in Japanese waters, near the Admiralty Islands, the depth being 4,575 fathoms. In 1896 the British ship Penguin got 5,155 fathoms north of New Zealand, breaking the record. This was the deepest found until 1900, when the United States cable survey ship Nero found a depth of 5,269 fathoms near Guam. Other deep soundings are those of the Albatross of the United States Fish Commission, which located a depth of 4,813 in the western Pacific, and of the Blake of the United States Coast Survey, which sounded 4,561 fathoms off Porto Rico, this being the deepest yet recorded in the Atlantic Ocean. No deep places have been found north of the 55th degree of latitude, which tends to confirm the theory of some that the Arctic Ocean is shallow. Consult: Agassiz, 'Three Cruises of the Blake'; Sigsbee, 'Deep-Sea Sounding and Dredging'; Tanner, 'Deep-Sea Exploration.'

CHARLES H. COCHRANE.

Deep-sea Life. It is difficult to draw the line between deep-sea life and that of shallow water, owing to the various depths in which certain species live. Thus the common shore-crab

of New England (*Cancer irroratus*) ranges to a depth of nearly 500 fathoms. The Challenger Expedition selected as defining the deep-sea fauna, a depth of 100 fathoms, others have taken 500 fathoms as marking its upper boundary, and still others a depth of 1,000 fathoms. A knowledge of this life is only obtainable by means of apparatus which will bring to the surface specimens from these great depths. The chief of these instruments, aside from the sounding lead which is very inadequate for this purpose, are dredges, tangles, and trawls, of which various patterns have been devised but which may be described in general terms as follows: The dredge consists of a rectangular frame-work of iron, one edge being sharpened or fitted with rake-like teeth to plow or scrape the bottom, while a net or bag fastened to the frame serves to hold the material collected and to bring it to the surface. This is best adapted for obtaining forms which live, attached to, or burrowing in, the ocean bottom. The trawl is a similar net so arranged as to be drawn just above the bottom and is valuable for collecting fishes which swim freely through the water. The tangle consists of large masses of unraveled rope, usually attached to a chain, which, sweeping over the ocean floor, entangles spiny forms like shrimps, starfish, sea urchins, as well as forms like hydroids and sea anemones, with numerous tentacles. Somewhat different is the Tanner net. This is so arranged that it can be sent down close to any desired depth, opened there, drawn through the water and then closed again before being drawn to the surface. By means of this the fauna of any desired depth can be collected without danger of admixture with forms from other depths. Details of the construction of these and many other pieces of collecting apparatus may be found in Agassiz, 'Three Cruises of the Blake'; Sigsbee, 'Deep-Sea Sounding and Dredging' (U. S. Coast Survey, 1880), and in the publications of the United States Fish Commission.

Although the dredge had previously been in use in the oyster and scallop fisheries it was first employed for scientific purposes (in moderate depths) by the Danish naturalist, Otto Fabricius Muller, 1750. (In America it was first used by Henry Wheatland of Salem, Mass.) Owing to faulty observations and to a belief that life could not exist in the greater depths of the ocean on account of the great pressure and the absence of light it was long thought that animals were not to be found at depths greater than 500 fathoms. This view disregarded the fact that Ross and Sabine, 1829, claimed to have obtained living animals from a depth of about 2,000 fathoms in Baffin Bay. Little by little evidence from sounding lines and submarine cables was accumulated which tended to overthrow this belief, but its complete disproval was accomplished by the dredgings of the United States Coast Survey in the Strait of Florida, 1867, when animals were found to be abundant at a depth of 700 fathoms. This was followed, 1869, by the expedition of the English ship Porcupine, which made successful casts of the dredge in 2,435 fathoms of water. Since that time numerous deep-sea dredgings have been conducted by the various governments, the most noticeable being the cruises of the English ship Challenger, the American Blake and Albatross, the French Travailleur and Talisman, the Russian Mininch, the Swedish Vanadis, the Dutch Barents Expedition, the German Tiefsee Expedition, and the explorations of the Prince of Monaco. The results of all these go to show that life, even of highly organized types, occurs in the greatest depths of the ocean.

Since the dredge, tangles and trawls can touch but a minute portion of the deeper parts of the ocean bottom we have, as yet, but an inadequate knowledge of the benthal or abyssal fauna for details of which the reader should consult the reports of the various expeditions previously mentioned. In general the following remarks may be made. The greater the depth, the fewer the species present. Thus in the collections of the Challenger, 2,050 species were taken in depths between 100 and 500 fathoms; 710 between 500 and 1,000; 600 between 1,000 and 1,500; 500 between 1,500 and 2,000 fathoms; 340 between 2,000 and 2,500, and 235 from depths greater than 2,500 fathoms. Again the results of the same expedition show that the number of individuals also decreases with the depth. In depths of over 1,000 fathoms the dredge rarely captured over 10 or 15 specimens of any one species, while in lesser depths hundreds of a kind are common.

The majority of the abyssal forms probably live on the surface ooze of the bottom and the minute organisms occurring in it, while these forms are in turn preyed upon by larger rapacious forms. A prominent feature of these is the frequent occurrence of phosphorescent organs which probably serve as a lure. Some are blind, some are provided with very large eyes, and it seems certain that all the light in the greater depths of the sea is produced by the phosphorescent organs. Another feature is the large size of some of the individuals. Thus while the shallow water species of the hydroid *Monocaulus* reach a length of but two or three inches, the deep-sea form is three feet long. It was hoped that the deep-sea fauna would reveal living representatives of extinct groups, but this hope was not realized, nothing having been found older than the horse-shoe crab (*Limulus*) the brachiopods, *Ceratodus*, the Port Jackson sharks and the Dipnoi of shallower or fresh waters.

Taking now the separate groups of living forms occurring in the deeper waters the following general remarks may be made: Plants are extremely rare and include only a few minute and inconspicuous forms. Even the lower *Algæ* (seaweeds) so common in shallower waters are lacking. Among the sponges the so-called glass sponges (*Hexactinellidæ*) are most abundant, some of the species being enormous (3 or 4 feet in diameter). The *Cœlenterata* are represented by the giant *Monocaulus*, already mentioned, and by a few jellyfish and corals. All groups of Echinoderms occur, most noticeable being the comparatively large number of crinoids and of holothurians, many of which are strange in structure and bizarre in outline. The *Arthropoda* consists largely of prawns, schizopods and isopods, some of the latter being gigantic in size, and the strange sea spiders (Pycnogonids), some having slender legs extending a foot or more from the body. Crabs are rare, as are also annelids and molluscs, while a few brachiopods (and these not of the oldest types) occur. Possibly the most interest-

ing are the fishes. Many of these are noticeable for their strange shapes, and especially for the long and slender teeth and the distensible stomachs. Thus the *Chiasmodon niger,* the black swallower, has been taken with a fish, actually larger than itself, coiled up in its stomach. On the other hand, *Eurypharynx* and *Gastrostomus,* the pelican fishes, are eel-like forms with enormous mouths and with a trunk not as long as the lower jaw. These lack teeth and are supposed to live not upon other fishes but upon minute forms which they collect in their enormous scoop net. *Ipnops* lacks eyes but has nearly the whole top of the head converted into a pair of phosphorescent organs, while in the *Ceratiidæ* the head frequently bears tentacles with phosphorescent organs at their tips. The ribbon fishes (*Regalecus*), which are occasionally found floating, exhausted or dead, at the surface of all the seas, are presumably deep-sea forms, although none have been drawn up in the trawl. As the common name indicates they are band-like in appearance, and since specimens have been taken measuring over 24 feet long it is possible that these or larger specimens may form part of the basis of sea-serpent stories. A noticeable feature of all the deep-sea forms is the prevalence of red and brown colors. Many of the fishes when brought to the surface have the viscera forced out through the mouth by the expansion of the air in the swim bladder.

Two factors render life possible in the greater depths of the sea. The constant currents descending from the surface in the polar regions to the bottom and thence to the equatorial regions bring with them the necessary oxygen, although the amount of this gas present in the greatest depths is much less than at the surface. The other factor, that of food, is, in the last analysis, furnished by the constant death of surface (pelagic) forms, whose dead bodies, slowly sinking through the water, furnish the nourishment needed by the simple abyssal animals, which in turn are preyed upon by those more highly organized. The literature of deep-sea life is enormous. The student should consult the reports of the various expeditions mentioned above, especially those of the Challenger expedition. Many papers will be found in the publications of the U. S. National Museum and the U. S. Fish Commission, while general summaries are afforded by Agassiz's, 'Three Cruises of the Blake'; Moseley's 'Notes of a Naturalist' and Sir Wyville Thompson's 'Voyage of the Challenger.'

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Deer, animals of the family *Cervidæ* (q.v.), which are noted for their grace of structure and their fleetness of motion. Since the earliest times they have been known as objects of the chase, and their meat, "venison," is considered a delicacy. They were especially renowned in Greece; and we find many references to them in Scripture. The male deer is usually called a "stag," or when mature a "hart." The female is called a "hind," or "doe." The term doe, however, is applied also to females of the antelope family.

The deer is valued not only as food, but for commercial purposes. The skins make a peculiarly strong, soft leather, known to trade as buckskin; this is valuable for shoes, saddles, etc. The skins with the fur on are sometimes used for tent-covering, and also make excellent rugs. The hoofs and horns are prized for ornamental purposes, especially the antlers of the roe-deer, which are utilized for making umbrella-handles, and for similar purposes; and the elk-horn, often employed in making knife-handles. The Chinese also make a medicine from stag-horn and they eat the antlers of certain species when "in the velvet."

The reindeer is, commercially considered, as valuable to the frozen north as the camel is to the desert traveler. Its fleetness and surefootedness, as well as its strength and power of endurance, render it invaluable to man in the far North. Consult: Lydekker, 'Deer of All Lands' (London 1898); Roosevelt (and others), 'The Deer Family' (New York 1902). See Cervidæ, the names of various genera, and English names, as Elk, Moose, etc.

Deer Forests, large tracts of waste or uncultivated and mostly uncultivable land, chiefly situated in the Highlands of Scotland, set apart as grounds in which the stag or red-deer is hunted for sport, but is otherwise protected and allowed to roam in its natural wild state. The name forest does not in this case imply the existence of trees. As a matter of fact most deer forests are mountains or high-lying stretches of ground, exhibiting large areas covered with heath, in many places peat-bogs, marshes, lochs, or bare rock, elsewhere patches of grass or other herbage, while plantations of trees of greater or less extent may also occur. Some of the deer forests are of very great extent, the larger covering, say, from 50,000 to 70,000 acres. The counties in which they are chiefly situated are Sutherland, Ross and Cromarty, Inverness, and Argyle, while they also exist in Aberdeen, Banff, Forfar, Perth, and Caithness. A number of them are retained in the hands of their proprietors, while many others are let, either for the shooting season or for a period of years, and in this case may bring a large rental to their owners. The annual letting value of the larger deer forests may run from £1,000 to £4,000 or even more, and the total rental of the deer forests of Scotland has been set down at over £200,000 per annum. Every stag killed costs the person who rents the ground about 50 guineas. For a deer forest is always an expensive affair, not only for the rent that has to be paid, but also for the number of keepers, gillies, watchers, beaters, etc., that have to be employed in connection with it.

Deer-grass (*Rhexia virginica*), the American representative of the Asiatic family of plants called *Melastomaceæ*, meadow-beauty family, of which only 10 species are found in the United States. The deer-grass extends from Maine to Florida, and west to Illinois, Missouri, and Louisiana. Other species extend the habitat of the genus to Texas. The flowers are conspicuous and showy, with bright rosy purple petals, and render the meadows unusually gay when adorned with patches of this lovely plant, entitling it to the common name of the meadow-beauty.

Deer-mouse, the common white-footed mouse of North America, a rodent of the family *Muridæ*, genus *Hesperomys*. The main color of its body is buff or fawn, growing dark along

the back, the feet and under parts being snowy white. With full, bright eyes, high, rounded ears, long whiskers and tail, graceful and sprightly movement, it is a very attractive little animal. It has been found to have small cheek-pouches. Its length rarely exceeds four inches, its tail being nearly as long. In different sections of the country its markings and habits are varied, and in some it seeks a home in the human dwelling, as do other mice.

Deer-stalking, an exciting but laborious mode of hunting the red-deer, in which, on account of the extreme shyness of the game, their far-sightedness and keen sense of smell, they have to be approached by cautious manœuvring before a chance of obtaining a shot occurs. Great patience and tact and a thorough knowledge of the ground are essential to a good stalker, who has to undergo many discomforts in crouching, creeping, and wading through bogs, etc. Advance from higher to lower ground is usually made, since the deer are always apt to look to the low ground as the source of danger. "Deer-driving" toward a point where the shooters are concealed is often practised, but is regarded as poor sport by the true deer-stalker.

Deerfield, Mass., a town of Franklin County, on the Connecticut River, and the Boston & Maine, and the New York, New Haven & Hartford R. R.'s; 33 miles north of Springfield. It is an agricultural region, and its industries are chiefly related to agricultural products. It has a high school and public library. The town contains the village of South Deerfield, and in colonial times was the scene of several contests with the Indians. Among them were the "Bloody Brook Massacre" (1675), and the burning of the village by the French and Indians under De Rouville (1703). Old Deerfield has a beautiful soldiers' monument, and there is at South Deerfield a marble monument commemorative of the Bloody Brook disaster. Eliza Allen Starr, author and art teacher, was born in Deerfield. Pop. (1900) 1,969.

Deerfield River, a river in Massachusetts, rising in southern Vermont and flowing generally southeast for 60 miles, when it enters the Connecticut River. The great fall of the river of nearly 1,100 feet in 50 miles furnishes water power at many places, of which the chief are at the Hoosac Tunnel and Shelburne Falls. Several streams nearly as large as the main river enter it from the north.

Deerhound, a Scotch greyhound, with a shaggy coat, covering his body, except the legs and tail. He is somewhat heavier than the English breed of greyhound, as well as somewhat larger. As the name suggests, this dog was employed for deer-hunting; and one of its older names was "buckhound."

Deerslayer, The, the last published (1841) of the 'Leatherstocking Tales,' by J. Fenimore Cooper, though written many years before its appearance. See NATTY BUMPPO.

De Facto, dē făk'tō (Lat. "in fact"), a legal term used in contradistinction to *de jure* (by right). It is commonly used in regard to governments, some of which are supposed to be based on divine right, others on usurpation. A *de facto* government, when established, is now always recognized as *de jure*. The term *de facto* is often applied in ordinary administrative law to designate the practice of illegal authority which has been exercised under apparent right.

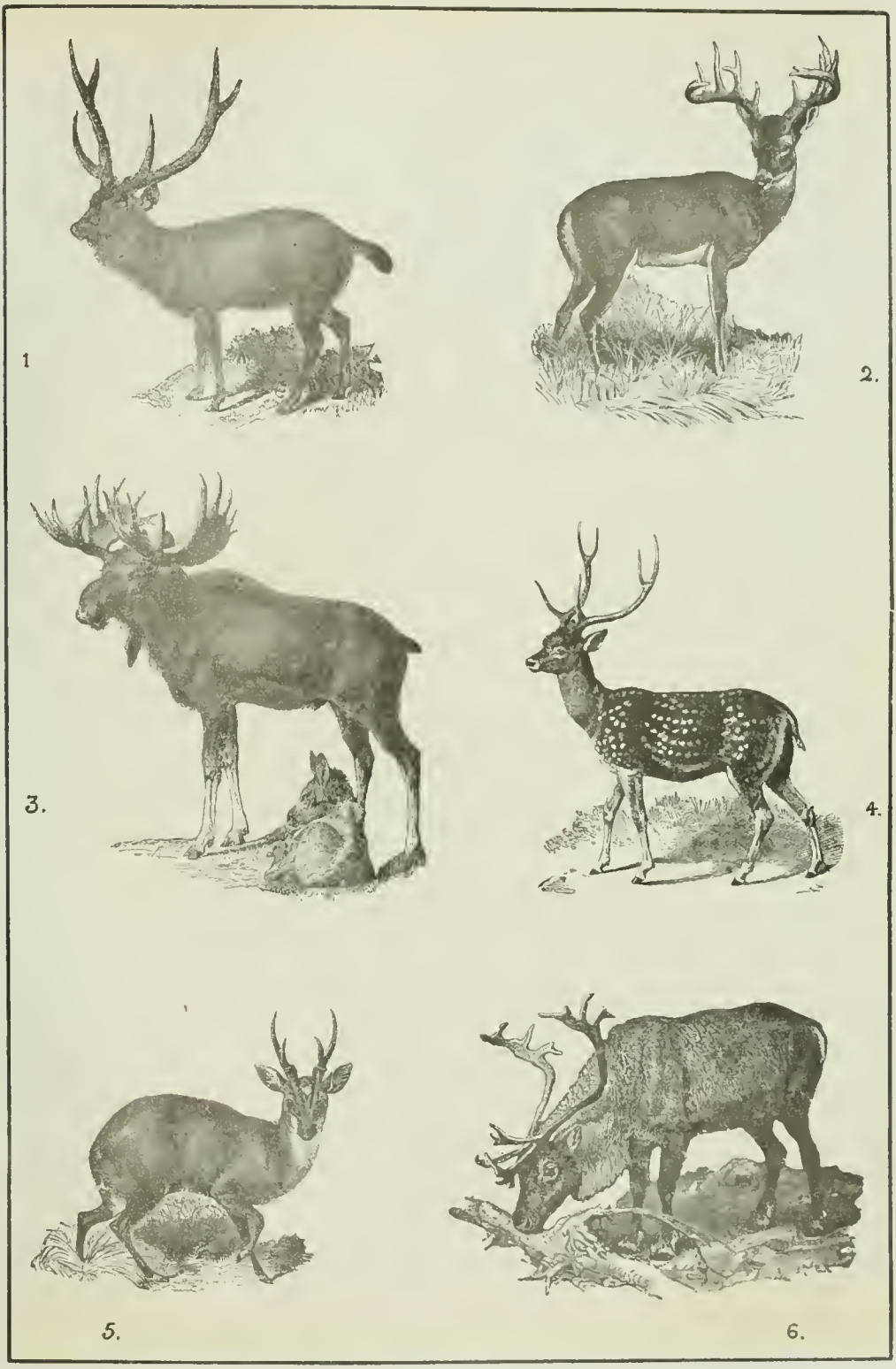
Defama'tion, the speaking or writing words of a person so as to hurt his good fame. Written defamation is termed libel, and oral defamation slander. The provisions of the law in respect of defamation, written or oral, are those of a civil nature, which give a remedy in damages to an injured individual; or of a criminal nature, which are devised for the security of the public. Slander was recognized as an individual wrong, and an offense against the public peace, at an early period of the English law. Libel was hardly known. This, however, is not strange; it is not to be supposed that it would have been, among an illiterate people, few of whom could write, and not many could read. Until education and learning had made considerable progress, and with them the arts and sciences, the offense of libel was comparatively rare. Libel had only very narrow limits in rude and despotic times, and not the same precision it has acquired in the days of liberty and science. As soon as writing became general it was used for abuse. People became jealous of their characters and reputations, which they found were thus in the power and at the mercy of every malicious writer, and then they claimed, as one of their first and absolute rights, the protection of character and reputation against a weapon more potent than slander, because committed to writing, and consequently more lasting and impressive and more dangerous to society. This was the mischief which the law of libel was designed to restrain. And when printing came into more general use it became more and more apparent that the law of libel was founded in reason and justice, and thus as learning progressed the law of defamation spread its influence, and finally placed a wholesome restraint upon the printing-press, as well as upon the instruments of the author, the critic, the painter, and the poet. The law forbids revenge, and the tongue is restrained. Character and reputation are treated as the safeguards of social position and success in life. They have always been recognized as absolute individual rights. Libels and defamations are classed as private injuries of the highest degree by Justinian in his 'Institutes.' Words are slanderous, and therefore actionable, when imputing the commission of some criminal offense involving moral turpitude. Words which impute to the party spoken of unfitness to perform the duties of an office or employment, or which charge that a party is infected with a contagious disease, are slanderous. A libel is anything which is written, printed, published, or pictured, calculated to injure the character of another by bringing him into ridicule, hatred, or contempt.

Default, a failure to appear in any court on the day assigned; especially applied to a defendant when he fails or neglects to plead or put in his answer on an appointed day. In such cases the plaintiff is entitled to sign judgment against him, which is called judgment by default, and the defendant is said to suffer judgment by default. Failure to perform an obligation is termed a default.

Defaux, Alexandre, ä lĕks-ändr dē-fō, French landscape painter; b. Bercy, near Paris, 27 Sept. 1826. He was a pupil of Corot, and his paintings display remarkable understanding of



SAMBUR (*Cervus Unicolor*).



1. The Sambur (Cervus Aristotelis).
2. The Virginia Deer (Cariacus virginianus).
3. The Elk (Alces palmatus).
4. The Axis (Cervus axis).
5. The Muntjac (Cervulus muntjac).
6. The Reindeer (Rangifer tarandus).

perspective. He began to exhibit in the Paris Salon in 1859 and among his numerous landscapes are: 'View at Caen'; 'Abandoned Race Course at Ivry'; 'View of St. Maur, Coast of Gravelle' (1863); 'Evening in Spring' (1869); 'Fine Winter Day in Bas Meudon' (1873); 'The Loire after a Flood' (1873); 'Birches at Fontainebleau' (1874); 'Gravel Pit at Fontainebleau' (1877); 'Forest of Fontainebleau' (1879); 'Harbor of Pont-Aven (1880); 'Old Birch-trees at Pigeon Pond in Fontainebleau'; 'Low Tide in Normandy' (1884); 'After the Storm' (1885).

Defeasance, dē-fē'zans, **Deed of,** in law, an instrument which defeats the force or operation of some other deed or estate; and that which in the same deed is called a condition, in a separate deed is called a defeasance.

Defectives, Education of. Systematic care of the defective classes began in America in 1815, when a young theological student, Thomas Hopkins Gallaudet (q.v.), started for Europe to study methods of teaching the deaf and dumb. A school for this class was opened in 1817, one for the blind in 1831, and one for the feeble-minded in 1845 — practically 15 years apart. In each case the first schools were in New England, the second in New York, the third in Pennsylvania; and these schools followed one another quickly. All started in the face of more or less distrust as to their feasibility, and all were experimental, being started through private initiative. A few pupils were taught and exhibited before the amazed public, when in the case of the deaf and the blind private funds in abundance were contributed and the schools quickly established as private corporations. In the case of the feeble-minded the first school to be incorporated was a public organization — that is, it was supported by the State. Before 1822 the State had not been educated to the point of supporting schools for the special classes, but by 1848 it was ready to see its duty toward even the idiotic. The three States named having led the way, the movement spread quickly into Ohio, Kentucky, Virginia, and Illinois — in almost identical order for each special class. Here, however, the schools arose as State institutions. It had become an accepted part of public policy for the State to provide a means of education for all her children. The superintendents of the early schools for the deaf and dumb were generally clergymen; those of the blind and the idiotic, generally physicians. The institutions were necessarily boarding schools; and the early ones were established as a rule in or near the State capitals, chiefly that their achievements might be kept before the members of the legislatures, on whose practical sympathy their continuance usually depended. The large private or semi-public institutions are confined to the eastern States. Their support comes chiefly from private bequests and the interest on invested endowment funds. All, however, receive what is termed State aid, and make annual report to the State legislatures, to the commissioners of public charities or of public education. All are governed by honorary boards of trustees or managers, who appoint the superintendent or principal. In the semi-public organization the managers form a self-appointing, close corporation; in the public, they are appointed usually by the State governor, by whom they may also be removed. The semi-public institutions are usually well endowed. Their expenditures are, thus, not limited by legislative grant; and they are free from political interference, an influence which has sometimes seriously affected the State institutions. As a rule, the institution plants are large and well equipped, and even when in cities have ample lawns and playgrounds. The earlier institutions were built on the congregate plan; the later have generally adopted the segregate or cottage plan. The pupils are not committed to these institutions, but are admitted or rejected by the boards of trustees on the recommendation of the superintendents. The early institutions for all three classes of defectives began purely as schools. And all those existing to-day, except those for the feeble-minded, discharge or graduate all pupils after these have completed the course of instruction. A very recent movement, started by the instructors of the deaf, is the affiliation of the educators of the defective classes with those of the national education association. It is being more and more recognized that the line between a defective and a normal child cannot be drawn hard and fast, and that many a child who appears dull and stupid in school is in some measure defective. Systematic work for the deaf and dumb, the blind, and the feeble-minded began in France, and from France America learned the early methods.

The Deaf.— About the middle of the last century three schools for the deaf and dumb were opened in Europe. Though they sprang up about the same time they were wholly independent in origin. In Paris the Abbé de l'Epée having observed two deaf-mute sisters conversing by means of gestures, seized upon the idea that in gesture language lay the secret of instructing the deaf and dumb. He therefore elaborated a system of gesture signs and made it a medium of instruction in the school which he started. Heinicke in Dresden and Braidwood in Edinburgh simply adopted articulate speech as the language of man and taught their pupils through it, requiring them to speak and read the lips of others. Reports of their success having reached America, several parents of deaf-mutes sent their children to Scotland to be educated. These deaf children returned no longer as mutes; they were able to converse readily by speaking and lip reading. One of these parents published a book in London, wrote articles for the New England periodicals, with the intention of arousing interest in the new work, and took steps to ascertain the number of deaf-mutes in Massachusetts. In 1812 a little school for deaf and dumb pupils was opened in Virginia, having for teacher one of the Braidwood family, who had come to America. The school was the first of its kind in America. It was soon given up, as was a similar effort in New York. These events though seeming to result in little, yet had great effect in directing intelligent attention to this field of work.

A physician of Hartford, Conn., one of whose little daughters had become deaf, spent eight years in agitating the question of starting a school for such children. Thomas Hopkins Gallaudet was sent abroad to study methods. He went to Great Britain to study the only method that Americans knew about; but the

doors of the Paris schools were closed to him. He found the science and art of teaching the deaf regarded as a business monopoly. After nine months he gave up hope of acquiring the long-coveted method and spent at the Paris school the three remaining months of the year. This time being far too short he induced a deaf-mute teacher in the school to accompany him to America. This was the brilliant and accomplished Laurent Clerk, who became an engine of power for establishing schools for deaf-mutes in our country. The French method or sign-language method was improved and further systematized by our early teachers and in this form was the basis of instruction in all our schools for half a century. During the absence of Dr. Gallaudet the Connecticut Asylum at Hartford had been incorporated, but soon changed its name to the American Asylum, for it was then supposed that one school could accommodate for many years all the pupils of the country. Upon Dr. Gallaudet's return he and Mr. Clerk traveled for eight months among prominent cities in behalf of the cause of the deaf. On 15 April 1817 school work began at Hartford with seven pupils. During the year 33 pupils came. This was the first permanent school in the country. The founders of our schools differing from practice abroad, immediately established theirs on a permanent basis. Private aid was necessary at first, but no sooner had the feasibility of the work been shown than public moneys were granted.

In 1818 a school was opened in New York under a teacher from Hartford. In Philadelphia a little class started in 1819 was organized as an institution in 1820. In 1819 Massachusetts had provided an appropriation for the education of 20 indigent pupils at Hartford, and in 1825 New Hampshire and Vermont adopted the same policy, being soon followed by other States. Thus, through the efforts of the founders of the Hartford school, the policy of educating deaf-mutes at the public expense was firmly established in the United States, and has been adopted with few exceptions. Some of the western States secured means for the education of deaf-mutes by constitutional provision. Two years after the founding of the Pennsylvania school, Kentucky followed with its institution, being the first to be supported by a State. Ohio and Virginia soon followed. Thereafter institutions sprang up rapidly in the South and West. In 1857 there was incorporated by Congress the Columbia Institution at Washington, D. C., which requires special mention. Though originally intended as a school for educating the deaf children of government beneficiaries, a change largely owing to the energy of its principal, Dr. Edward M. Gallaudet, soon enabled the institution to confer collegiate degrees. It was then divided into two departments, the advanced taking the name of the National Deaf-Mute College. Thus, in 1864, America had taken a step "unprecedented in the history of deaf-mute instruction."

Most of the deaf and dumb are either born deaf or become so before acquiring language. They are dumb because they are deaf, and without special instruction can never know any but a gestural language. The pioneer educators of the deaf in this country were all "broad-minded men of liberal education," and they set a high standard at the outset for the work. A language of signs they saw was the key to the instruction of their pupils, who, indeed, were allowed so few years of schooling, that no time was to be lost in laboring over the extraordinary difficulties of teaching them speech. The language of signs is ideographic — "being readily expressive of ideas and emotions," rather than of phraseology. Put into words their order is very different from the natural order. The late superintendent of the Illinois institution, Dr. Gillett, writes: "When reduced to a system they [signs] form a convenient means of conveying to one mind the ideas conceived by another, though not clothed in the language in which a cultured mind expresses them. One addressed in the sign language receives the idea and translates it into English without any intimation of the phraseology in the mind of the speaker, so that a dozen persons familiar with the sign language, observing the gesticulations of a speaker, would each translate correctly the thoughts given forth, but no two of them would be in exactly the same phraseology. It is a concrete language, in which the expression of abstract ideas is exceedingly difficult." As the ideas are given out chiefly by means of hand gestures, schools using the sign language as a means of instruction are said to follow or use the manual method. Among the manually taught deaf this language early becomes the vernacular. As it is a language of living pictures, such deaf people think in pictures and dream in them. The sign language is said to be to the deaf what spoken language is to the hearing; and yet its use in the school room is deemed by many teachers extremely detrimental to the acquisition of the English language, which all our educators of the deaf agree is their chief end and aim for their pupils. They differ widely, however, over the use of signs. The greater number believe a moderate use of them to be economical of time and extremely useful to the deaf in the acquisition of knowledge. There is a small but growing number who dispense with signs *in toto* just as soon as possible. These latter teach by the intuitive, direct, or "English language method." They teach English by and through English, spoken, read, and written. It is extraordinarily difficult to get started by this oral method. But its advocates claim that once well started their pupils advance more logically, more surely, more precisely, and finally more swiftly than pupils allowed to use signs. Advocates of using the signs together with other means claim that the minds of most of their new pupils are sluggish from want of language to think in, and that they need to be aroused by the quickest method. They assert that "A large percentage of the deaf under proper methods can obtain a very useful amount of speech and lip-reading, but [that] there is also a large percentage of them that would be greatly restricted in their mental development, if allowed no other means of instruction." A proper and conservative use of the sign language always tends to mental development, saves time, and is the most efficient aid known in the acquisition of written and spoken language." The other school affirms that the two methods or systems are mutually exclusive, saying: "Of course no pupil can be taught under the intuitive and the sign method at the same time, and it is impossible to combine into one system a method which is depend-

ent upon the sign language at every stage of instruction with a method which dispenses absolutely with the sign language at every stage in teaching the English language. In the sign-language method instructors aim to teach the vernacular language through the intervention of signs, but their deaf-mute pupils acquire a mixture of natural signs, pantomime, conventional signs and finger spelling which becomes the habitual vehicle of thought and expression, wherever it is possible to use a gestural language, to the exclusion of the English language." A form of the English language method, taught at the Rochester, N. Y., institution, substitutes finger spelling for signs as these methods are used in manual schools, and is called the "manual alphabet method."

The history of the rise of the oral method is interesting. As has been said, the manual method reigned supreme for the first 50 years of the work. In 1843 Horace Mann, secretary of the Massachusetts State Board of Education, and Dr. Howe, director of the Perkins Institution for the Blind in Boston, made a tour of Europe. In his next annual report Horace Mann praised the oral method as taught in Germany, stating that it was superior to the method employed in America. The report was widely read, and caused no little commotion among our teachers of the deaf. Several went abroad to see for themselves, but did not agree with Horace Mann, and little change was then made in American methods. Still as a result of their recommendations, classes in articulation were introduced into several schools. Later, in 1864, there was an agitation in Massachusetts for the incorporation of an oral school in that State, and a small private school of the kind was soon opened near Boston. In 1867 the Clarke Institution (named for its founder) was incorporated by the Massachusetts legislature, and was opened as an oral school. In the same year a former teacher of an Austrian school opened in New York what soon became the New York institution for the improved instruction of deaf-mutes. Dr. Edward M. Gallaudet after investigations abroad reported that if the whole body of the deaf were to be restricted to one kind of instruction, he favored results to be obtained by the manual methods of America, but he advocated the introduction of articulation into all the schools of the country. A conference of principals of American institutions adopted resolutions in the line of President Gallaudet's recommendations, and classes in articulation were very generally introduced. During the next few years a gradual movement abroad toward the abolition of signs was evident; and at the second international conference at Milan in 1880, an overwhelming majority of the delegates present voted in favor of the oral method. American instructors of the deaf paid more and more attention to the question of methods, and conventions of articulation teachers were held. In the meantime Dr. Alexander Graham Bell had introduced to teachers his father's system of visible speech (q.v.). A similar but simpler system of visible speech symbols had been independently worked out by a Mr. Zera Whipple, of Mystic, Conn.; and more recently the Lyon phonetic manual has been devised, which is founded on the principle of visible speech and may be written in the air by the fingers. In 1888 the royal commission of the United Kingdom voted "that every child who is deaf should have full opportunity of being educated on the pure oral system," but that those found physically or mentally disqualified "should be either removed from the oral department of the school of taught elsewhere on the sign and manual system." In 1890 the American association to promote the teaching of speech to the deaf was incorporated, with Dr. Alexander Graham Bell as president. Dr. Bell immediately endowed the association handsomely. It cannot be denied that at times the controversy over methods has been bitter; to-day, however, it has been reduced to a generous rivalry, in which the champions of the various methods and systems are striving earnestly to find out the best means of instructing the deaf and to pursue it. The majority of our schools do not limit their teaching to any one method, but are eclectic, calling themselves "combined system" schools. The work for the deaf in this land has progressed remarkably. No other country has so many deaf pupils under instruction as this has, none has provided so generously for them, and there is none in which their educators are more alert to test new inventions and appliances that may bear upon the methods of instruction. And yet, unquestionably, the education of the deaf is still in its youth.

Soon after the beginning of the work 'The Annals of the Deaf' was started (now in its 44th volume). It is said to be the leading publication of its kind in the world. Its editor, Dr. Edward A. Fay, has made a most thorough investigation into the results of marriages of the deaf. The Volta prize of 25,000 francs awarded by the French government to Dr. Bell for his invention of the telephone, he applied to the founding of a bureau for the purpose of collecting and diffusing knowledge concerning the deaf. This is the Volta bureau of Washington, D. C. It has already published a large number of papers, studies, and books. The influence of Dr. Bell upon the work for the deaf has been deep and lasting. The invention of the telephone itself resulted from his experiments upon a device which he hoped would enable the deaf to read the vibrations of the human voice. Though a Scotchman by birth, he is practically an American, and has devoted his best energies and his means to furthering the work which he has made his profession. His great efforts have been toward the promotion of speech-teaching to the deaf.

As Dr. Gillett has said, "The instruction of the deaf is one of the most difficult fields in the entire department of education for achievement at once successful and satisfactory to the teacher." For many years the parent school at Hartford was parent in the sense of providing principals and teachers for other schools. The New York institution has also furnished schools with many officers and teachers. It is only within comparatively recent years that normal classes, as such, have come to exist in a few of the schools. Among others, the Clarke Institution, the Wisconsin Phonological Institute, the school at Bala, Pa., and Gallaudet College have them — the latter announcing that it has opened to a limited number of college graduates annually, normal fellowships of $500, tenable for one year. Thus has the standard of deaf-mute teaching come to be in line with

modern university methods of training teachers. Public day schools for the deaf have sprung up in various places. The Horace Mann School at Boston is a notable example. They fill an unquestioned need, as many parents refuse to send their deaf children off to an institution. A still further movement toward decentralization has come to pass in Wisconsin. Wherever in this State a few deaf children can be gathered near their homes, State aid will be given to pay teachers sent there to teach them. And this movement is tending to become more and more general. All these day schools spread the oral method. An important effect of the rise of this method has been the lowering of the age when deaf children are received, and of lengthening their term of instruction; also of largely increasing the number of women teachers employed. The Home at Bala for the training in speech of little deaf children before they are of school age, takes them at the age when normal children learn to talk and teaches speech by talking to them and having them talk back as if they heard. There are several private oral schools for the deaf in this country where the pupils pay tuition. One of the best is the Wright-Humason school in New York. With the lowering of the age of pupils, kindergarten methods have been made use of more and more; though no true kindergarten can be conducted in schools where language comes so hard and so late, where even natural signs are arbitrarily interdicted, and where there can be no music. But the occupations and the games are widely applicable and are now universally used. The first duty of the teacher is to establish communication with the deaf child and thereafter, during his whole course at school, more than in any other kind of educational work, to make language the end of training and other subjects the means of varying language teaching. This statement is strictly true only of elementary education, but then the majority of deaf pupils do not advance far beyond the elementary stage, because so very much time is absorbed in language work that their progress in other things is slow; then, too, parents are prone to call their boys away from school as soon as they believe these can help sustain the family. A few of the brighter and more ambitious pupils from the schools take the course at the National Deaf-Mute College, now called Gallaudet College, where they have "an opportunity to secure the advantages of a rigid and thorough course of intellectual training in the higher walks of literature and the liberal arts." Occasionally we hear of deaf pupils taking high school work in schools with hearing pupils, and even of being graduated from colleges of the hearing.

The course of training at American schools for the deaf has always been practical. Indeed, industrial training is almost essential for those young people who would form industrious habits and facility in the use of tools, that will put them on their feet when they enter the world of labor; for most deaf pupils will have to work for their living. The trained deaf are not at all disqualified from self-support by simple inability to hear. In their schools general manual training is followed with a pupil until, for one reason or another, he chooses his trade or it is chosen for him. The general equipment for trade teaching is excellent. Printing is an extremely useful occupation for the deaf, especially in the acquisition of idiomatic language; and every institution for their instruction publishes one or more papers. Our educated deaf people form a quiet, well-behaved, self-supporting part of the community. They have formed local and national societies for mutual benefit. The convention of the deaf that met in 1893 at the Columbian Exposition at Chicago was the largest meeting of the kind ever held. Their speeches and deliberations and social gatherings occupied several days. Within the grounds of Gallaudet College at Washington stands a beautiful memorial statue of Gallaudet teaching a little deaf and dumb girl. It was presented to the college by the deaf of the whole country. In this memorial the deaf have made fitting recognition of their indebtedness to education.

The Deaf-blind.— "Obstacles are things to be overcome" is the motto given by Dr. Howe to the Perkins Institution for the Blind. When this remarkable man learned in 1837 that up in the mountains of New Hampshire there was a little girl not only blind but also deaf and dumb, he eagerly sought out the child and obtained the parents' consent to take her to South Boston to be educated. He had already formed a theory as to how he would reach a mind thus doubly shut in, and with the finding of Laura Bridgman came the wished-for opportunity to test this theory. It should be noted that Laura Bridgman saw and heard until she was two years old. She had been rather a delicate child, however, having enjoyed only about four months of robust health, when she sickened, her disease raging with great violence during five weeks, "when her eyes and ears were inflamed, suppurated and their contents were discharged." Her sufferings continued for months, and it was not "until four years of age that the poor child's bodily health seemed restored." She was intelligently active, following her mother about the house, seeming anxious to feel of everything, and thus to learn about it; and she developed signs for her father and her mother, and for some things.

She was eight years old when brought to the Perkins Institution. Dr. Howe writes: "There was one of two ways to be adopted: either to go on and build up a language of signs on the basis of the natural language, which she had already herself commenced, or to teach her the purely arbitrary language in common use; that is, to give her a sign for every individual thing, or to give her a knowledge of letters, by the combination of which she might express her idea of the existence, and the mode and condition of existence, of anything. The former would have been easy, but very ineffectual; the latter seemed very difficult, but, if accomplished, very effectual; I determined, therefore, to try the latter." After the child had become adjusted to the change of homes, Dr. Howe began teaching her by means of common articles with which she was familiar — spoons, forks, keys, etc., on which labels with their names printed in raised letters had been pasted. Similar detached labels were given her to feel. Her touch was acute enough, hence she was able to match labels, placing that for book on the book, etc. She did this easily and willingly because she received approbation for so doing; but the idea that the printed word stood for the name of the object had not entered her brain. Then other detached

labels were cut up into their component letters. These her memory soon enabled her to build into wholes or the words she had felt. Such exercises continued for many weeks to be only a meaningless play to the poor child. The success had been "about as great as teaching a very knowing dog," when suddenly the idea flashed upon her that "Here was a way by which she herself could make up a sign for anything that was in her own mind, and show it to another mind, and at once her countenance lighted up with a human expression; it was no longer a dog or parrot,—it was an immortal spirit, eagerly seizing upon a new link of union with other spirits! I could almost fix upon the moment when this truth dawned upon her mind, and spread its light to her countenance; I saw that the great obstacle was overcome, and that henceforward nothing but patient and persevering, plain and straightforward efforts were to be used." Next, she was given metal type each bearing some embossed letter, and a frame with holes to receive them. With this appliance Laura readily wrote the name of any object she knew and by writing them fixed in mind an extensive vocabulary of common names. Then the less cumbrous manual alphabet was taught her. Here was a means by which she could both write and read; she could spell to her teacher and read what her teacher spelled into her hand. Dr. Howe's reports teem with interesting psychologic material. At the end of the year he writes: "She is nine years of age, and yet her knowledge of language is not greater than a common child of three years. There has been no difficulty in communicating knowledge of facts, positive qualities of bodies, numbers, etc.; but the words expressive of them, which other children learn by hearing, as they learn to talk, must all be communicated to Laura by a circuitous and tedious method. In all the knowledge which is acquired by the perceptive faculties, she is of course backward; because, previous to her coming here, her perceptive faculties were probably less exercised in one week than those of common children are in one hour." And so her instruction went on. Through it all the child showed an eagerness to learn and to put herself in touch with the world that was a powerful aid to the teacher. In a few years, when Oliver Caswell, also deaf, dumb, and blind, came to the institution, Laura naturally took great interest in teaching him, and thereby profited much herself. As she approached womanhood her education was already good. She had learned to sew, to knit, and to do fancy work. She often visited her home, but her true home was the institution; there she died in her 60th year, the first case of any one so afflicted made capable of leading an industrious and happy life, and as the first case, historically the most remarkable. Popular interest in Laura Bridgman, both in this country and abroad, was naturally very great. The printed reports of her progress which were eagerly awaited were as eagerly absorbed. Distinguished foreigners coming to Boston visited her. Charles Dickens wrote in his American notes a sympathetic account of his impressions of her. The way to give liberty to the imprisoned mind had been made plain.

In the year 1887 something like the old interest was aroused by accounts of the brilliant deaf, dumb, and blind child in Alabama, Helen Keller. This child had lost sight and hearing at 19 months as a result of a serious illness. Like Laura she kept actively interested in all that surrounded her, and like Laura she developed her own little language of signs. When she was six years old, her friends, who knew of Laura Bridgman's case, applied to Boston for a teacher. In the following year Miss Annie M. Sullivan was sent. This lady was able to put herself in touch with Helen in a very short time and in a marvelous way. In fact, she has proved herself to be a most remarkable teacher. Following in general the methods adopted in teaching Laura, Miss Sullivan began her work by putting Helen in possession of the manual alphabet. A doll was happily chosen to begin with; and with the doll on the child's lap, the teacher formed in Helen's hand the finger letters *d-o-l-l*. Other familiar objects were similarly introduced, and strange as it may seem, that which had taken three months to reach in Laura's case in Helen's took but a few days; or, in Miss Sullivan's words, "it was not more than a week before she understood that all things were thus identified." Her teacher writes: "Never did a child apply herself more joyfully to any task than did Helen to the acquisition of new words. In a few days she had mastered the manual alphabet and learned upward of 100 names." After teaching verbs and prepositions through action and position Miss Sullivan made a departure. She began to use new words in connection with old words, letting Helen understand them if possible from the context. The child adopted these words "often without inquiry." In this way she became familiar with the use of many words whose meaning never had to be explained to her.

As to the letters of the raised alphabet, Miss Sullivan writes: "Incredible as it may seem, she learned all the letters both capital and small in one day." Then came the primer; then pencil writing than which there is scarcely a more difficult exercise for the blind to learn; and yet Helen "wrote without assistance a correctly spelled and legible letter to one of her cousins; and this was only a little more than a month after her first lesson in chirography." Braille, or tangible point writing, became a constant delight to her.

Words like "perhaps" and "suppose" and those indicative of abstract ideas she learned more through association and repetition than through any explanation of her teacher. The child had the language sense largely developed. Much of the time when no one was talking with her she was reading in books printed in raised letters. Dr. Bell in trying to account for Helen's wonderful familiarity with idiomatic English, considers of great significance the statement of Miss Sullivan, that, "long before she could read them [the books] . . . she would amuse herself for hours each day in carefully passing her fingers over the words, searching for such words as she knew." In 1888, when Helen was eight years old her teacher took her to South Boston, where she could have the advantage of all the appliances and embossed books that a school for the blind affords. Thenceforth an account of her progress reads like a romance. It was no more difficult for her to learn a new word in German or in Greek than in English; and she took great delight in picking up and using French or Greek phrases.

And when later she came to study these languages, she seemed to advance without effort in the knowledge of them. The educators of the deaf have good reason to comprehend the exceeding difficulty of teaching their pupils to articulate, and rightly feel that Helen Keller's rapid mastery of speech is by all odds her most wonderful achievement. After she had been in South Boston some little time she heard of a Swedish girl afflicted like herself, who had learned to speak, and she said, 'I must learn to speak.' Miss Sullivan took her to Miss Sarah Fuller, principal of the Horace Mann School for the Deaf, and through Helen's only means of learning the position of the vocal organs in speech was to put her fingers on the lips, tongue, teeth, and throat of the speaker, she learned in 10 lessons to articulate so well that she could carry on an intelligible and audible conversation, having communication addressed to her spelled into her hand by the manual alphabet. She has learned since that time to read from the lips and throat of a speaker by placing her fingers lightly on them; so that any one sitting near her can converse with her just as though she could both hear and see. She spent a winter at the Wright-Humason Private School for the Deaf, where she improved her articulation. When Helen was 10 years old she entered the Cambridge School for Girls, Miss Sullivan accompanying her. There, under the guidance of Mr. Arthur Gilman, the director of the school, she took the course preparatory to entering Radcliffe College. At the end of one year she took the regular required examinations in the history of Greece and Rome, in English, in Latin, in elementary French, in elementary German, and in advanced German. As the questions and other matter were read into her hand by Mr. Gilman himself, Helen wrote her answers and translations on an ordinary typewriter. She passed the tests in every subject, taking "honors" in English and German. Mr. Gilman writes: "I think that I may say that no candidate in Harvard or Radcliffe College was graded higher than Helen in English." There are still other children afflicted like Helen who are doing splendid work, but, "taking this child all in all," says Dr. Job Williams, principal of the American School for the Deaf at Hartford, "and making due allowance for every possible aid that has been given her, and for all unconscious exaggeration due to friendly admiration, there yet remains so much that is marvelous as to place her beyond comparison with any other child of whom we have ever heard. The whole history of literature reveals nothing equal to her language productions from one of her years, even among those possessed of all their faculties. She is a genius, a prodigy, a phenomenon." The other deaf-blind children under instruction are some at schools for the blind, some at schools for the deaf. They must always have a special teacher, and use embossed books and adapted appliances. All are being taught on principles used in teaching Helen. In South Boston, where there are several, they attend classes with other pupils, the special teacher acting simply as interpreter and companion. See Blind, Education of; Braille, Louis; Feeble-minded; Howe, Samuel Gridley.

Edward Ellis Allen,
Principal of the Pennsylvania Institution for the Instruction of the Blind.

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Defence of Poesie, The. The title given to Sir Philip Sidney's 'Apologie for Poetrie' when printed for the second time in the third edition of the 'Arcadia' in 1598.

Defendant, in law, the party against whom a complaint, demand, or charge is brought, in a civil or criminal proceeding; one who is summoned into court, and defends, denies, or opposes the demand or charge, and maintains his own right. The term is applied even if the party admits the claim.

Defender of the Faith (*defensor fidei*), the title bestowed on Henry VIII. of England by Pope Leo X. (1521) in recognition of the monarch's great service to the Roman Catholic Church in writing his *Assertio Septem Sacramentorum adversus Martinum Lutherum* (vindication of the seven sacraments against Martin Luther). Pallavicini, in his history of the Council of Trent, describes the great satisfaction given to the papal court by King Henry's book and the modes suggested by various cardinals of acknowledging the obligation to the monarch. The Pope, with the aid of his secretary, Sadolet, had a form of bull drawn up conferring on Henry the title "Defender of the Faith." So that he might be on a par in the matter of titles relating to religion with the king of Spain's "Catholic majesty" and the king of France's "most Christian majesty," Henry was to be "Defender of the Faith." The draft of the bull was read to the college of cardinals and one of them suggested that the fittest title for the king of England would be "Orthodox King" or "Orthodox Majesty"; another proposed "Apostolic King"; a third "Angelic King." But Wolsey had already

signified to the court of Rome his royal master's choice of the title *Defensor Fidei* and accordingly that was adopted.

Defenders, a Roman Catholic association in Ireland (1784–98), the opponents of the Peep o' Day Boys.

Defensor Matrimonii, or Defensor Vinculi Matrimonialis, Defender of the Marriage Tie, an official in every episcopal jurisdiction of the Roman Catholic Church, whose duty it is in all cases of petitions or suits for judicial separation of married couples or for annulment on whatever ground of marriage contracts or of the marriage relation, to defend with all his power the validity of the contract and resist its abrogation. The Defensor is required to be in person present at every stage of the trial of a matrimonial cause, and he must have access to all the records and all the testimony. Not only may he, in case the court decides for the nullity of the marriage, appeal to a court of second instance; he is under obligation to appeal every single case; and if he demands it, he must be allowed a further appeal to the highest court. Nor is that all; he has the right, and it is his duty, to open the case anew if he finds there was any serious flaw in the judgment of nullity. In short, a matrimonial cause involving nullity of a consummated marriage contract is in the Church of Rome never finally and absolutely determined so long as either of the two parties to the suit is living.

Deffand, Marie de Vichy-Chamrond, mä-rē dė vē-shē-shäṅ-rôṅ dĕf-fäṅ, Marquise du, French letter writer: b. Château de Chamrond, France, 1697; d. Paris 24 Sept. 1780. Her acquirements were very considerable, but no care seems to have been taken to regulate her temper and disposition, which were marked by a high degree of selfishness, conspicuous throughout her life. In 1718 she married the Marquis du Deffand, from whom she separated after 10 years. During the latter part of her long life she became the centre of a literary coterie, which included some of the greatest geniuses of the age. Among women remarkable for their wit and talents in the 18th century Madame du Deffand claims a distinguished place, though she left no monument of her abilities except her epistolary correspondence, highly praised by D'Alembert as affording a model of style in that species of composition. During the last 30 years of her life she was blind. In 1810 was published 'Correspondence inédite de Madame du Deffand, avec D'Alembert, Montesquieu, le Président Hénault, la Duchesse du Maine; Mesdames de Choiseul, de Staël; le Marquis d'Argens, le Chevalier d'Aydie, etc.' Her letters to the celebrated Horace Walpole have likewise been printed.

Defiance, Ohio, city, county-seat of Defiance County; on the Maumee River, the Wabash, and the Baltimore & Ohio R. R.'s, and the Cincinnati and Toledo canal; 50 miles south of Toledo. It is a trade centre and has woolen-mills, bicycle factories, machine and carriage shops, a national bank, daily and weekly newspapers. Pop. 7,650.

Defiance College, a coeducational (nonsect.) institution in Defiance, Ohio; founded in 1884; reported at the end of 1902: Professors and instructors, 10; students, 125; volumes in the library, 3,000; grounds and buildings valued at $20,000; benefactions, $500; income, $2,500; number of graduates, 160; president, W. McReynolds.

Defila'ding, in military strategics, that branch of the science of fortification, the object of which is to determine, when the intended work would be commanded by eminences within range, the directions or heights of the lines of rampart or parapet, so that the interior of the work may not be incommoded by a fire directed to it from such heights.

Defile, in military language, is a narrow way, admitting only a few persons abreast. Hence to march before any one with a narrow front, in column or by files, is called defiling.

Definite Proportions, Laws of. See Atomic Theory.

Definition (from the Latin *definitio*) of a thing signifies, in lexicography, a concise account of its essential and characteristic points. A definition should embrace all the essential properties of the object intended to be defined, and not admit any which do not belong to it, which is often extremely difficult, on account of the shades and gradations by which different things are blended. The most simple things are the least capable of definition, from the difficulty of finding terms more simple and intelligible than the one to be defined. According to the old scholastic logic, a definition must give the mark of the genus (*nota generalis seu genus*) and of the species (*nota specialis seu differentia specifica*); for instance, a barn is a building (*nota generalis*) for the purpose of preserving corn, etc., (*nota specialis*). According to Aristotle every strict definition could be divided into two distinct parts; one dealing with the genus, and the other declaring the specific difference by which the given subject varies from others of the same order. Kant and his followers on the contrary make definition merely a list of essential marks summed up without any distinction between genus and difference.

In *optics* definition means the defining power of a lens — the giving of a clear and distinct image of an object together with all details of importance.

Defoe, Daniel, English writer: b. London 1661; d. there, 20 April 1731. His father, whose name was James Foe, carried on the trade of a butcher. In 1685 he joined the insurrection of the Duke of Monmouth, and had the good fortune to escape to London, where he went into business, but was unsuccessful. He subsequently obtained an appointment under government, which he held from 1695 to 1699, and afterward engaged in various mercantile speculations. His business misfortunes, however, caused him to turn his attention to literature. In 1697 he wrote an 'Essay on Projects.' In 1701 appeared his satire 'The True-born Englishman,' designed to show the folly of the popular objection to King William, as a foreigner, by a people who were themselves a mixture of so many races. In 1702, when the High Church party seemed disposed to carry matters strongly against the Dissenters, he published 'The Shortest Way with the Dissenters,' an ironical recommendation of persecution, so gravely covered that many persons were deceived by it. It was, however, voted a

seditious libel by the House of Commons, 25 Feb. 1703; and the author avowing himself, to secure his printer and publisher, was prosecuted and sentenced to fine, imprisonment, and the pillory. He underwent the latter punishment with great equanimity, and was so far from being ashamed of it that he wrote a 'Hymn to the Pillory,' alluding to this circumstance. In February 1704, while in Newgate, he commenced the 'Review,' a sort of newspaper containing papers of literary and political criticism, supposed to be discussed by a scandal club. This paper was continued for nine years, and was entirely conducted by Defoe, even during protracted absences from England, in one of which, in 1710–11, he edited 45 numbers of the Edinburgh 'Courant.' In 1705 he wrote a short account of 'The Apparition of Mrs. Veal,' intended, it is said, to create an increased demand for a popular translation of Drelincourt on Death. This story, like others by Defoe, though told with great circumstantiality and appearance of good faith, is entirely fictitious. In 1706 he published his largest poem, entitled 'Jure Divino,' a satire on the doctrine of divine right. When the accession of the House of Hanover became an interesting topic he wrote in its favor, but so obtuse was the public to his irony that he was imprisoned for his productions as libels in favor of the Pretender. In 1715 he published 'The Family Instructor,' a work inculcating moral and religious duties in a lively manner, by narrative and dialogue. To this his well-known 'Religious Courtship' (1722) formed a third volume. In 1719 appeared the most popular of all his performances, 'The Life and Surprising Adventures of Robinson Crusoe,' the favorable reception of which was immediate and universal. The success of Defoe in this induced him to write a number of other lives and adventures in character; as 'Moll Flanders'; 'Captain Singleton'; 'Roxanna'; 'Duncan Campbell'; and 'The Memoirs of a Cavalier,' pronounced by the Earl of Chatham the best history of the civil war extant. In 1722 he published a Journal of the Plague in 1665, in the person of a citizen supposed to have been a witness of it. In 1724 he published the 'Great Law of Subordination,' and in 1726 his 'Political History of the Devil,' to which he afterward added, in the same style of reasoning, wit, and ridicule, a 'System of Magic.' He is also author of a 'Tour through the Island of Great Britain'; 'The Complete English Tradesman, a Plan of English Commerce,' etc. See Wilson, 'Memoirs of the Life and Times of Daniel Defoe' (1830); Lee, 'Newly Discovered Writings of Defoe, with Life' (1869); Minto, 'Defoe' (1879); Wright, 'Life of Defoe' (1894).

De Fon'taine, Felix, American journalist: b. Boston, Mass., 1832; d. Columbus, S. C., 11 Dec. 1866. The first statement given to the North of the attack on Fort Sumter, was written by him; and he was correspondent of the Charleston *Courier* from the principal battlefields during the Civil War. Subsequently he went to New York, and was connected with the *Herald* much of the time until his death. He was the author of 'Cyclopædia of the Best Thoughts of Charles Dickens'; 'Gleanings from a Confederate Army Note-Book'; and 'Birds of a Feather Flock Together.'

De For'est, John William, American novelist: b. Humphreysville, Conn., 31 March 1826. He passed many years in independent study and foreign travel, becoming a proficient in several languages; entered the army as captain at the outbreak of the Civil War, and rose to major; and since 1850 has been a fertile writer of essays, short stories, and novels for the leading magazines, taking prominent rank among American novelists. Among his works are: 'History of the Indians of Connecticut' (1853); 'Oriental Acquaintance' (1856); 'Witching Times' (1856); 'European Acquaintance' (1858); 'Seacliff' (1859); 'Miss Ravenel's Conversion' (1867); 'Overland' (1871); 'Kate Beaumont' (1872); 'The Wetherell Affair' (1873); 'Honest John Vane' (1875); 'Justine Vane' (1875); 'Playing the Mischief' (1876); 'Irene Vane' (1877); 'Irene, the Missionary' (1879); 'The Oddest of Courtships; or, The Bloody Chasm' (1881); 'A Lover's Revolt' (1898); 'Overland' (1899); 'The De Forests of Avesnes and New Netherland' (1900).

DeForest Wireless Telegraph System, The. The inception of this system, invented by Dr. Lee DeForest, dates back to 1899. Dr. DeForest's idea was to develop a receiver, working on an electrolytic principle, which would be entirely automatic in its actions, requiring no tapping back or decohering arrangement like the coheror, but allowing the use of a telephone receiver for rapid and accurate work. The development of this receiver has steadily progressed until at the present time it appears to be far more sensitive than any other form, absolutely reliable in its action and enables operation over distances quite impossible with the coheror or magnetic detector from a given source of power at the transmitter. The electrolytic principles embodied in the receiver are as follows: When the electrodes on the small electrolytic cell consist of fine tentacles the small points or resistance of the cell will depend first upon the distance between the electrodes and, second, upon the applied motive force at the terminals of the cell. If the electrodes are extremely close together the resistance on the cell is normally very low. The passage of the electrical wave has the effect of decomposing the minute film of electrolyte between the electrodes and causing, by the sudden formation of gas, a great increase in the resistance of the cell. The normal conductivity is instantly restored upon the cessation of the electrical wave and the receiver rendered automatically sensitive for the succeeding impulse. If on the other hand the electrodes are removed a considerable distance from each other the cell will establish a counter electromotive force of polarization, which will almost completely oppose the passage of current from the electrical battery through the cell. In this case a minute layer of oxygen gas surrounds the exposed surface of the fine anode. The passage of the Hertzian wave now causes a sudden reabsorption, allowing temporarily a sudden increase in the flow of current.

The normal conditions of resistance and capacity of the DeForest receiver are extremely constant, which enables the use of a sensitive relay for operating a call bell or a tape recorder, a feature which is granted by no other form of automatic receiver known to-day in the wireless telegraph art. Moreover, this constantly allows

a far closer tuning or syntonization with this receiver than is afforded by the coheror, where the capacity and resistance are constantly varying factors, due to the continually re-arrangement of the filings under the repeated shocks of the tapping-back device. This has enabled the DeForest Company to attain more proficiency in tuning, allowing also long distances of transmission with comparatively small power. The DeForest System employs sound reading almost entirely, thus allowing greater speed and an ability to work through interferences from atmospheric disturbances, etc., due to the ability of the human ear to distinguish between the sounds of the true interfering signals.

The DeForest transmitter employs several novel features. Dr. DeForest was the first to use the alternating current transformer in place of the direct current interrupter and induction coil. He ordinarily employs 110 volts, 60 cycles alternating current, such as can be obtained generally from the electric light wires, and inserts a dry key or oil break key directly in this work. The current is stepped up a transformer to 20,000 volts and applied to the terminals of two batteries of Leyden jars arranged in series. In the oscillating circuit with these jars are included a spark gap, an adjustable syntonizing helix, by means of which the tuning on the transmitter is accomplished. The speed with which the operator can make the Morse signals with this key, the clearness of the spark, its instant response and freedom from flame, are marked characteristics of this transmitter. This same method is applied to 1 k.w. sets and to larger power up to 50 k.w. The 1 k.w. transmitters are good for 75 miles over land or 250 miles over sea-water, with a direct proportionate increase of distance with increase of power. In the larger sets glass plate condensers in oil are employed in place of the Leyden jars.

The DeForest tuning arrangement and the receiver differ distinctly from those employed by any other system. As an illustration of its efficiency may be cited the case of the stations at the World's Fair Grounds, Saint Louis Exposition. Here are located a 20 horse-power station for transmitting to Chicago and a small station at the steel observation tower for transmitting press dispatches to the Saint Louis newspapers. The station in the Electricity Building, located midway between these other two, can receive from either one *ad libitum* without the slightest indication of signals from the other, although less than a quarter of a mile distant from the station transmitting to Chicago. Simultaneously messages have been received from both transmitting stations at the same time from the same antennæ wire. The commercial adaptability of the system is best demonstrated by the fact that the Saint Louis station is now handling a large amount of paid commercial business with Springfield, Chicago, and Kansas City, distances of 100, 300 and 275 miles overland respectively. Remarkable distances have been covered over fresh and salt water by the DeForest system. The A. B. Wolvin has been in splendid communication with the Cleveland station while 75 miles north of Port Huron, in Lake Huron, a distance of 275 miles, considerable portion of which was overland. During the Russian-Japanese war the London *Times* maintained a continuous service reporting the war maneuvers in the waters of the Yellow Sea from on board their dispatch boat Haimun to the DeForest station at Wei Hai Wei. The greatest distance covered here was 275 miles, employing a 1 k.w. transmitter and less than 96 feet of antennæ wire. This service was maintained in the face of the continual operation of 20 or more ship sets belonging to the Japanese, Russians, English and German navies in these waters; and is the most striking proof of the efficiency of the method of receiving which employs the electrolytic responder and the telephone receiver. The United States Navy is now installing at Panama, Porto Rico, Cuba, Pensacola and Key West five of the largest stations in the world for regular commercial work, as well as for maintaining service with naval and merchant vessels. In all these stations the DeForest apparatus will be used; 35 k.w. is the power installed at the largest of these stations, as it is intended to eventually cover much greater distances than the 1,000 miles which separate four of the above mentioned stations.

Deformities. In medicine deformities are deviations from the normal development of some part or parts of the body. These may mar the appearance from the æsthetic standpoint, or they may be internal or unknown, resulting in serious disturbance of health, or having no influence on the life processes whatever. Deformities may be congenital or acquired, in the former case usually being the result of defective development, in the second to some disease process. A number of forms of defective development result in the production of monsters (q.v.). Special characteristic deformities are harelip, congenital dislocation of the hip, web-fingers, supernumerary fingers, club-hands, congenital club-foot, bow-legs, knock-knees, and various minor anomalies. The commonest forms of acquired deformities are usually due to some disease of the nervous system, as acute spinal paralysis, acute anterior polyomyelitis of children. This latter causes paralyses of the arms or legs, which result in deformities from insufficient growth. Hemorrhage of the brain frequently occurring during childbirth may result in hemiplegia in the infant, with consequent deformities. Rachitis or rickets frequently induces deformities. Other forms of acquired deformity are hammer-toe and acquired club-foot, the latter usually resulting from paralysis.

Defregger, Franz, frănts dā-frĕg-ĕr, German genre painter: b. Stronach 30 April 1835. The subjects of almost all his pictures are drawn from the Tyrolese peasant life, his few religious pictures having been in the main unsuccessful.

De Fu'niak Springs, Fla., town, county-seat of Walton County; situated on the Louisville & Nashville R.R., 80 miles northeast of Pensacola, and about 25 miles north of the Gulf of Mexico. The industries of the place are those of an agricultural and fruit-growing country. It is the site of a State Normal School, and the Florida Chautauqua. Its population increased nearly threefold between 1890 and 1900. Pop. (1900) 1,661.

De Gar'mo, Charles, American educator: b. Wisconsin 7 Jan. 1849. He was graduated from the State Normal University of Illinois in 1873, was principal of public schools, Naples, Ill., 1873–6; professor of modern languages at

the State Normal University 1886–90; and president of Swarthmore College 1891–8. Since 1898 he has been professor of the science and art of education at Cornell University. He has published: 'Essentials of Method'; 'Herbart and Herbartians'; 'Language Lessons.'

Degas, de-gä, **Edgar Hilaire Germain,** ēdgar-mān, French painter and engraver: b. Paris 19 July 1834. He was a pupil of La Motte, and studied at the Beaux Arts in Paris. He is one of the most interesting members of the impressionist school, having worked in pastel, etching, dry point, and stone-engraving, producing numerous interiors of theatres, and café-concerts, foyers of the opera, views of the circus and of laundries, studies of dancers, etc., and all with a masterly touch. He also produced several portraits of Manet.

Degeneracy, a term much in vogue at the present time to indicate certain physical and mental peculiarities found in some individuals who are unable to keep up in the struggle for existence according to more ethical and honest methods. That abnormalities in ethical and mental development are apt to be associated with abnormalities in the human frame, is the central assumption on which this hypothesis rests, and in recent years the school of Lombroso in Italy, and its followers elsewhere, have developed a very one-sided series of studies on this general thesis. Thus the argument would read that, given 100 epileptics, it will be found that they show a very high percentage of physical anomalies in the way of variations in the configuration of the ear, modifications of the so-called normal palate, differences in the lengths of the arms and legs, changes in the color of the iris, and other physical anomalies. Like inferences are drawn from the study of idiots, defectives, the insane and criminal classes, and an entirely new school of criminology has been based upon the anthropometric rules of Lombroso. In the present discussion the word degeneracy is restricted to include only certain border-line conditions. In cases of frank idiocy, epilepsy, and insanity, sufficiently comprehensive terms are at hand to describe the conditions, whereas the term degeneracy is by modern students best reserved for those individuals in whom the ethical and moral developments show a non-normal character. It is therefore in the fields of criminology and abnormal psychology that the term has its deepest and widest application. The relationship of genius to degeneracy is much played upon by superficial writers. The term is an unfortunate one in large measure, as it offers an easy and convenient means of designation for a large and unsorted group of phenomena that are very imperfectly understood even by the most searching scholars.

Degeneration (in Pathology). In medical pathology degeneration is one of the processes that occur in the cells of an organ whereby different grades of disintegration and shrinking take place. It is one of the retrograde or breaking-down processes in contrast to those of abnormal growth and increase, although in many of the degenerations both processes are going on side by side. When abnormal intracellular metabolism slowly converts the cell plasma into useless and abnormal substances the process is known as degeneration, and then following upon such degenerations there usually results a partial or complete death of the plasma, leading to the destruction of the cell. In large measure, according to the character of the substances produced in the degenerative processes, various forms of degeneration are known. If in the organs there is a deposit of a waxy or lardy substance derived from the serum of the blood, the degeneration is known as amyloid degeneration. This is very frequently found in several organs at the same time, and results in large part from the infectious diseases accompanied by nutritional disturbances. Thus, in connection with chronic tuberculosis, syphilis, and chronic dysentery, amyloid degeneration is apt to occur. Hyaline degeneration is another form, which takes place in the connective tissue by which that type of cell is rendered homogeneous. Hyaline degeneration commonly occurs in the arteries and heart-valves, and is frequently associated with chalky infiltrations in these structures. Colloid degeneration occurs in certain forms of cancer in which the substance in the cells resembles softened glue. Mucous degeneration consists in the transformation of the leading tissues into a transparent, viscid, homogeneous mass consisting of mucins and pseudomucins. Mucoid degeneration takes place largely in the connective tissue in the epithelial cells, and sometimes as a result of the disturbance of the functions of the thyroid gland as in myxædema. Fatty degeneration is a degeneration in which fat globules are deposited in the cells. Albuminous degeneration, or cloudy swelling, as it is sometimes called, consists in a fine granulation of a number of cells in the body, particularly in the kidneys, liver, and brain. This acute degeneration is very frequently associated with fatty degeneration, and is due in great part to anomalies of nutrition largely produced by bacteriological agencies, as in the infectious diseases, and also at times to auto-intoxic products having their origin within the body itself as a result of perverted oxidation. Pigmentary degeneration is another form, in which are deposited in the cells small or large quantities of iron compounds derived largely from the blood and known as pigments. Consult: Hektoen, 'Text-book of Pathology.'

Degeneration, a work of Max Nordau (1895), which aimed at a scientific criticism of those degenerates not upon the acknowledged lists of the criminal classes. "Degenerates," asserted Nordau, "are not always criminals, prostitutes, anarchists, and pronounced lunatics; they are often authors and artists. These, however, manifest the same mental characteristics, and for the most part the same somatic features, as the members of the above-mentioned anthropological family, who satisfy their unhealthy impulses with the knife of the assassin or the bomb of the dynamiter, instead of with pen and pencil. . . . Now I have undertaken the work of investigating the tendencies of the fashions in art and literature; of proving that they have their source in the degeneracy of their authors, and that the enthusiasm of their admirers is for manifestations of more or less pronounced moral insanity and dementia."

Degeneration as a Factor in Evolution. Degeneration, in biology, is a term used to describe those not unfrequent cases where an entire organism falls below the structural level of its young stages, or where an organ in the

same way loses its fullness of function, and becomes more or less atrophied, abortive, and simplified. Thus many parasitic worms, crustaceans, etc., are emphatically simpler than their free-swimming larvæ, and the sessile adult ascidian shows only traces of the vertebrate characters which are plain enough in the active young. Thus too, a crustacean which starts with a well-developed eye, may exhibit the gradual loss of this on assuming a dark habitat. The term is best confined to cases where a level of structure exhibited during early life is more or less lost in the adult. Degeneration must be distinguished (1) from occasional abortion; (2) from reversion to an ancestral type; and (3) from the occurrence of rudimentary and undeveloped organs where a character possessed by ancestral types remains more or less undeveloped, or shows itself only in embryonic life. Degeneration may be due to the environment, or to cessation of function, or to some more subtle constitutional cause. Absence of food, heat, light, etc., may mean the absence of the necessary stimulus for the growth and maintenance of the organs; or superfluity of food may cause one system to preponderate over others. Nor can it be doubted that cessation of function checks the food-supply to a given organ, and in other ways helps to bring about its degeneration. But on the other hand, some less obvious cause — the fatigue of early life, a constitutional sluggishness, etc., may share in conditioning degeneration, as in the case of the majority of the *Tunicata*. Weismann and others, however, would explain degeneration by what they call the non-operation of natural selection. On this view, organs are not only developed but maintained by natural selection; and if it happen that an organ is no longer an advantage in this struggle for existence (for example, eyes in dark caves), then natural selection no longer maintains that organ, and it disappears in the course of generations. Weismann applies this ultra-Darwinian conception especially to cases which might be called non-development rather than actual degeneration — for example, to the slightly developed wings of the *Apteryx*. Most cases of degeneration properly so called appear hardly to require his subtle explanation, but find a sufficient one in the nature of the environment, in the effects of stopped function, and in the constitution of the organism. The theory of the degeneration of man from a high state has been superseded by the belief in a development from low savagery (see ANTHROPOLOGY; ARCHÆOLOGY). Consult: Lankester, 'Degeneration'; Weismann, 'Ueber den Rückschritt in der Natur'; Nordau, 'Degeneration.' See also ENVIRONMENT; EVOLUTION, etc.

Deger, dā-gėr, **Ernst,** German painter: b. Bockenem, Hanover, 15 April 1809; d. Dusseldorf 27 Jan. 1885. He was a pupil of Wach and Schadow, in Berlin and Dusseldorf, becoming a painter in oil and of frescoes, and giving much attention to the latter form of work. He decorated the chapel at Castle Stolzenfels for Frederick William IV. of Prussia, becoming in 1869 professor at the Dusseldorf Academy and member of the Berlin and Munich academies. Among his works are: 'Pieta' (1830); 'Bearing the Cross' (1832); 'Annunciation' (1834); 'Virgin Adoring Christ' (1836); 'Madonnas and Seven Scenes from the Life of Christ' (1841–51), in St. Apollinaris' Chapel, Remagen; 'Adam and Eve' (1853), Raczynski Gallery, Berlin. His works are noted for vigor and finish. He was a leader of the so-called "Nazarean School."

De Gérando, Joseph Marie, zhō-zĕf mä-rē dė zhā-rän-dō, BARON, French philosopher and statesman: b. Lyons 29 Feb. 1772; d. Paris November 1842. On the siege of Lyons in 1793 he took up arms in its defense, and greatly distinguished himself by his bravery, but was subsequently obliged to flee. He returned to France on the proclamation of an amnesty, and joined a cavalry regiment. While in garrison at Colmar he composed an essay on the theme proposed by the French Institute, 'Quelle est l'Influence des Signes sur l'Art de Penser?' and gained the prize. In 1799 he took office under Lucien Bonaparte as minister of the interior, and became secretary-general of that department in 1804. In 1811 he was made a councilor of state, and in 1812 governor of Catalonia. In 1819 he commenced a course of lectures in the Faculté de Droit, in Paris, on public and administrative law, suspended in 1822, and resumed in 1828. He was raised to the peerage in 1837. De Gérando acquired great fame by his philosophical writings, in which he follows with some deviations the school of Condillac. His principal works are: 'Des Signes et de L'Art de Penser considérés dans leur Rapports Mutuels' (1800), an enlargement of the dissertation formerly written for the French Institute; 'De la Génération des Connaissances Humaines' (1802); 'Histoire comparée des Systèmes de Philosophie' (1804), completed after his death; 'Du perfectionnement Moral et de l'Education de Soi-même,' a treatise which gained the prize of the French Academy in 1825; 'De l'Education des Sourds-muets de Naissance' (1827); 'Institutes du Droit administratif Français, ou Eléments du Code administratif réunis et mis en ordre' (1829–45); 'De la Bienfaisance Publique' (1839).

Deggendorf, dĕg'gĕn-dôrf, Germany, a town of Lower Bavaria, near the Danube, 39 miles northwest of Passau. It has manufactures of paper, linen, woolens, stoneware, and matches. Its Church of the Holy Sepulchre is visited annually by a large number of pilgrims. Pop. (1900) 6,843.

Degluti'tion, the physiological act of swallowing, or the process by which food is conveyed to the stomach.

Degradation of clerics in the Roman Catholic Church has two degrees, being either "verbal" or "actual." By "actual" degradation the offender, besides being deposed from the ministry, is deprived of his order and of the canonical privileges attached to his order, and in particular is delivered over to the secular arm for punishment; nor does any one who makes a violent assault on him incur the excommunication decreed against whoever violently attacks a cleric or a monk. By "verbal" degradation the cleric is deprived of all his clerical functions and stripped of his Church benefice if he holds any; but he retains the privileges of his order, and is not handed over to the secular power: he has right of appeal to ecclesiastical courts. If his offense merits imprisonment he must be shut up in some monastery or other ecclesiastical establishment; and though he is degraded, still were one to make

an assault on the [illegible] would, *ipso facto*, incur excommunication. Nevertheless, since the ordination rite imprints an indelible character, the degraded cleric, whether by actual or verbal degradation, is still priest or deacon or whatever he was before in the ministry; and his purely sacerdotal and sacramental acts, even his priestly absolution, if given *in articulo mortis* or in grave peril of death when no priest in full Church communion is at hand, is valid. So, too, his celebration of the mass is valid though sacrilegious.

The process of actual degradation is as follows. The culprit, in the attire of his order and bearing in his hands some instrument of his clerical functions, a chalice or a mass-book, is brought before the bishop. That emblem of his priestly state is taken away from him; then he is stripped of his ecclesiastical attire, and his head is shaven to obliterate the mark of the clerical tonsure. Finally the bishop addresses him in these words: "By the authority of God Almighty . . . we take away from thee the clerical habit and depose, degrade, and deprive thee of all order, benefice, and clerical privilege."

De Grasse, Comte. See GRASSE, COMTE DE.

Degree, in universities, a title and badge, accompanied with a certificate, conferred on the student, after examination, as a testimony of his proficiency in certain branches of knowledge, and entitling him to certain privileges. Some degrees are conferred, without previous examination, in general recognition of the graduate's eminence in the literary, philosophical, or scientific world. These are called honorary degrees. The degrees are much the same in all universities; but the regulations regarding them, and the previous discipline or studies, differ. The original degrees are bachelor, master, and doctor, to which many modifying characters are added, according to the faculties of arts, law, divinity, medicine, science, literature, etc., in which each degree is taken.

In music, a step ascending or descending the tone-ladder. It may consist of a semi-tone, a tone, or (in the minor scale) of an augmented tone. When the notes are on the same line or in the same space, they are of the same degree. The interval of a second is one degree, the interval of a third two degrees, and so on, irrespective of the steps being tones or semi-tones. Hence, also, notes are in the same degree whether they are natural, flat, or sharp, of the same note, as C and C sharp, E and E flat; and they are in different degrees when, though the same note on an instrument of fixed intonation, they are called by different names, as F sharp and G flat, C sharp and D flat.

In mathematics, a unit in a scale of measurement; specifically, in algebra, the amount reached by adding together the exponents of the factors or variables contained in any single term of an equation or expression; and in trigonometry, the unit of measurement for arcs, or the angles they subtend.

Degree. See ANGLE; CIRCLE.

Degrees of Latitude and Longitude. Degree of latitude is the space or distance on the meridian through which an observer must move to vary his latitude by 1°, or to increase or diminish the distance of a star from the zenith by 1°; and which, on the supposition of the perfect sphericity of the earth, is the 360th part of the meridian.

Degree of longitude is the space between the two meridians that make an angle of 1° with each other at the poles, the quantity or length of which is variable, according to the latitude.

Degrees, Measurement of. After Newton had taught that the earth, on account of its motion round its axis, must be highest near the equator, and that the diameter of the equator must be longer, by one 230th part, than the diameter from pole to pole, the French wished to investigate the subject further by actual measurement. The measurement was begun with the result that the axis of the poles was found to be longer than a diameter of the equator, and that the earth was, in form, more like a lemon than an orange. For 40 years disputes were maintained on this point without settling the question; and at last the Academy of Sciences resolved, on the proposition of Condamine, to have a degree measured at the equator (the expedition went to South America in 1735), and one in Lapland (Kittis and Tornea being the extreme stations to which the expedition was sent in 1736). It was found that the northern degree was greater than that under the equator, and that Newton's conjecture was right. But the question still remained, How great is the flattening of our planet? The theory said one 230th part, if the earth had been in a perfectly liquid state when it began its rotation. The calculations, however, always gave different results, varying according to the different measurements adopted as the basis of them; for measurements had been made, not only in America and Lapland, but also in France, England, Hungary, and Italy. When the French established their new and admirable system of measures and weights upon the basis of the metre, which was to be the ten millionth part of the distance from the equator to the pole (3.2808992 English feet, or 39.37 inches), it was necessary to know with accuracy the circumference and the flattening of the earth. A measurement, therefore, took place in France, not of one degree, but of 10 degrees, from Dunkirk to Formentera, one of the Balearic Islands. In Sweden in 1802 the degree, which 80 years before had been measured by Maupertuis, was now measured again with better instruments, and thus the circumference and flattening of the earth were pretty well ascertained. After the Peace of Amiens the measurements of degrees just made in England, under Gen. Roy, by Lieut.-Col. Mudge, were connected with those in France; and thus an arc of 20 degrees, from the Balearic Islands over France and England, to the Orkneys, was measured, and the flattening of the earth calculated to be 1-304th (the most recent estimate being 1-292). In India, the measurement of a degree, begun by Lambton, was continued by Everest and completed by Walker. The measurement of an arc of 25° 20′ from Hammerfest to Ismailia was completed in 1855. Similar measurements have been continued to the present time, and at the Geodetic Congress in London in 1900, it was announced that English experts were engaged in measuring an arc of the meridian of 104° from Cape Colony to Alexandria, and had made considerable progress.

The annexed table shows the lengths of a degree of longitude for places at every degree of latitude from 0° to 90°. It is computed on the supposition that the earth is a sphere.

Deg. lat.	Eng. miles	Deg. lat.	Eng. miles	Deg. lat.	Eng. miles
0	69.07	31	59.13	61	33.45
1	69.06	32	58.51	62	32.40
2	69.03	33	57.87	63	31.33
3	68.97	34	57.20	64	30.24
4	68.90	35	56.51	65	29.15
5	68.81	36	55.81	66	28.06
6	68.62	37	55.10	67	26.96
7	68.48	38	54.37	68	25.85
8	68.31	39	53.62	69	24.73
9	68.15	40	52.85	70	23.60
10	67.95	41	52.07	71	22.47
11	67.73	42	51.27	72	21.32
12	67.48	43	50.46	73	20.17
13	67.21	44	49.63	74	19.02
14	66.95	45	48.78	75	17.86
15	66.65	46	47.93	76	16.70
16	66.31	47	47.06	77	15.52
17	65.98	48	46.16	78	14.35
18	65.62	49	45.26	79	13.17
19	65.24	50	44.35	80	11.98
20	64.84	51	43.42	81	10.79
21	64.42	52	42.48	82	9.59
22	63.97	53	41.53	83	8.41
23	63.51	54	40.56	84	7.21
24	63.03	55	39.58	85	6.00
25	62.53	56	38.58	86	4.81
26	62.02	57	37.58	87	3.61
27	61.48	58	36.57	88	2.41
28	60.93	59	35.54	89	1.21
29	60.35	60	34.50	90	0.00
30	59.75				

Measurement of a Degree of Longitude.— The degrees of longitude are largest under the equator, and diminish continually toward the pole. Under the equator a degree of longitude contains 60 geographical, 69.16 statute miles. If the form of the earth is not entirely regular, the degrees of longitude on the same parallel of latitude cannot all be of the same length; and it has been proposed to investigate this by actual measurement. This task is, in the trigonometric part, as easy as the measurement of a degree of latitude; but in the astronomical part it is 15 times more difficult. The difference of the longitude of two places is determined by the difference of the hour of the day at the same point of time in the two; as a place situated 15 degrees to the east of another has noon a whole hour earlier. One hour, therefore, corresponds to 15 degrees, or 1,042½ statute miles, under the equator, or 5,504,400 feet; a minute of time to 91,740 feet, and a second of time to 1,529 feet. A mistake of a second of time, therefore, in calculating the longitude of two places, makes a corresponding error in space. To determine time within two or three seconds, by means of rockets, at a distance of 1,042½ miles is impossible; and while the measurement of an arc corresponding to this distance trigonometrically, may be attended with an error to the amount of 200 feet, an astronomical measurement would leave an uncertainty of 2,000 feet. The earlier measurements of the French were directed, in the north, by Maupertuis; in the south by Bouguer. Since that time measurements have been made in all the great continents of the globe — in Pennsylvania, in the time of Maskelyne, by Mason and Dixon; at the Cape of Good Hope by Lacaille, completed by Maclear; in Prussia by Bessel; in Russia by Struve; in Denmark by Schumacher; and in England by Roy Kater, and Colby. The French arc from Formentara to Dunkirk was measured by Mechain and Delambre. The results of the measurements, as given by Airy, make the equatorial diameter 7925.648, and the polar diameter 7899.170 miles. Bessel's results are almost identical, namely, equatorial diameter 7925.604, and polar diameter 7899.114 miles. There is an international association, having as its main object the correlation of all degree measurements and connected data with the view of accurately ascertaining the figure of the earth.

De Haas, dē häs, **Maurice Frederick Hendrick,** American marine painter: b. Rotterdam 12 Dec. 1832; d. 23 Nov. 1895. He studied in England and at The Hague under Louis Meyer, and in 1857 was appointed painter to the Dutch navy. In 1859 he came to the United States and opened a studio in New York which remained his home henceforth. Among his paintings are: 'Admiral Farragut's Fleet passing New Orleans'; 'Coast of France'; 'Sunset at Sea'; 'Moonlight at Sea'; 'Sunset at Pigeon Cove'; 'Sunrise in a Fog at Newport'; 'Shipwreck'; 'Menhaden Boats off Long Island'; and 'Off Marblehead.'

De Haven, Edwin J., American naval officer and explorer: b. Philadelphia 1819; d. there 2 Oct. 1865. He entered the navy in his 10th year and resigned in 1857. He commanded the expedition which left New York in 1850 to search for Sir John Franklin.

Dehorning, the act or practice of depriving animals, specifically cattle, of their horns. Clippers or shears have been invented for the operation, wherewith it is performed quickly and with comparatively little pain, and scarcely any disturbance of the animal's normal functions or condition. The most favorable conditions of weather, etc., should be chosen for it, and the aid of a skilful operator is desirable. When all features of cruelty or unnecessary pain are avoided, there is believed to be much to justify the practice of dehorning, inasmuch as it tends, among other benefits, to convenience, safety, and comfort in the handling of cattle, especially during their transportation from place to place.

Dehra Dun, dĕh'rä doon. 1. A district in the Northwest Provinces, British India. It lies at the base of the Himalayas. Good roads, cultivated fields, hedges, streams flowing through meadows all, in parts of this district, look like some of the old country districts of the well-cultivated parts of Europe. The area is 1,193 square miles; pop. 170,252. 2. Dehra is the name of the chief town or capital of the district. It has an English garrison and contains a number of European inhabitants. Pop. 27,813.

Dei Gratia, dē-ī grā'shĭ-a (Lat. "by the grace of God"), a formula which many European sovereigns add to their title, and which is taken from an expression of the apostle Paul in the New Testament. It was first used by the clergy in the time of Constantine the Great, as an expression of dependence upon the grace of God; and afterward the higher clergy came to use along with it the addition *et apostolicæ sedis* (by the grace of God and the apostolic see). In the time of the Carlovingian race the secular princes also assumed it; and in course of time it came to be regarded as asserting something

like the divine right of kings and their independence of any earthly power. The expression has been made use of on the coins of many nations.

Deiamba, dā yam'ba, Congo tobacco, a plant growing wild in the marshy districts of Congo, Africa, the flowers of which produce a narcotic effect when smoked.

Deianira. See DEJANIRA.

Deidamia (*Deidameia*), daughter of Lycomedes: she bore Pyrrhus and Oneirus to Achilles, during his abode at Scyrus.

Deiler, John Hanno, American educator: b. Altoetting, Upper Bavaria, Germany, 8 Aug. 1849. He was graduated at the Royal Normal College, Freising, and studied at the Royal Polytechnic Institute, Munich. He taught in the public schools of Munich until 1871, and was principal of a German school in New Orleans 1872–9. He has been professor of German in the University of Louisiana and Tulane University since 1879. He has been connected with various German societies in New Orleans, and has published 'Das Redemptions-System im Staat Louisiana'; 'Geschichte der Deutschen Kirchengemeinden im Staat Louisiana'; 'Geschichte der Einwanderung von 1820–1896'; 'Deutschen Gesellschaften von New Orleans'; etc.

Deimos (dī'mŏs) and **Pho'bos**, the names respectively of the outer and inner satellites of Mars, discovered by Prof. Asaph Hall in the summer of 1877, with the 26-inch equatorial of the Washington Observatory. Deimos revolves about its primary in 30 hours and 18 minutes, while Phobos, a most extraordinary body, accomplishes its revolution in 7 hours, 39 minutes, and 14 seconds, being at a distance of only about 3,700 miles from the surface of Mars.

Deioces, dē-ī'ō-sēz, Median king: fl. about seven centuries B.C. He rose from a private station to be the founder of the Median empire. By acting as arbitrator in the disputes which took place in his own vicinity, he had acquired a high reputation for wisdom and justice; and when the Medes, in consequence of their revolt from the Assyrians, stood in need of a sovereign, they found none whose claims to the honor seemed stronger than those of Deioces. Immediately after his election he assumed great state, surrounded himself with body-guards, and built the city of Ecbatana, in the centre of which he resided, almost wholly hidden from public view, transacting all business by deputies. His administration was vigorous, and after a peaceful reign of 35 years he was able to transmit the throne, without a contest, to his son Phraortes.

Deiotarus, dē-ī-ŏt'a-rus, Galatian tetrarch: d. 30 B.C. He received from the Roman senate the title of king of that province and Armenia Minor, on account of services rendered to the Romans in the Asiatic wars. In the civil war he joined the party of Pompey. Cæsar took from him Armenia, obliged him to march with him against Pharnaces, and left him nothing but the title of royalty. He was accused of having plotted against the life of Cæsar, from which charge Cicero defended him in an oration yet extant. After the murder of Cæsar he returned to his dominions, joined Brutus, and afterward Augustus.

Deiphobus, dē-if'ō bŭs, in Greek legend the son of Priam and Hecuba, who married Helen after the death of Paris, but was betrayed by her to the Greeks.

Deipnosophist, dē-ip-nos'ō-fist (from the Greek *Deipnosophistæ*, learned men at dinner), one of an ancient sect of philosophers famed for their learned conversation at meals. The work or rather compilation, 'Deipnosophistæ,' of the celebrated Greek grammarian and rhetorician, Athenæus, who flourished about two centuries before Christ, has preserved to posterity thousands of quotations and names of authors to the number of 700, that otherwise would have been lost. The "learned guests" in his voluminous work numbered 20, who meet and banquet for days, entertaining one another with excerpts which Athenæus must have gathered at great pains and labor from the library of Alexandria, afterward destroyed. The titles of books he puts into the mouths of his characters alone number 2,500.

Deira, dē'i-rā, the name of an ancient Anglican kingdom. The date of the origin is unknown, but prior to the 6th century A.D. the territory extending from the Humber to the Tees, now included in the present Yorkshire, England, was known by that name. About the year 600 A.D. it was united with Bernicia to form the kingdom of Northumbria, later created an earldom.

Deir el-Baheri, dār-ĕl-bäh'rē, or **Der el-Bachri**, is a temple seat in the district of Thebes, on the west bank of the Nile, opposite Karnak, which is about five kilometres distance from it. At Der el-Bachri are some remarkable ruins of a temple built on terraces up the hillside which edges the alluvial plain. This is known as the temple of Queen Ratasu. The building is probably contemporary with those of Luxor and Karnak, being erected in the same style of magnificence.

Deir-el-komar, kā'mär ("convent of the moon"), a town of Syria, formerly the capital of the Druses, 13 miles south-southeast of Beyrout. It is situated on the edge of a deep and picturesque glen of Mount Lebanon, on the opposite side of which stands the palace Bteddin, the summer residence of the Christian governor of Lebanon. The town's chief industry is the making of embroideries and rich stuffs. Pop. 8,000, mostly Maronites.

Deira, dē'i-ra, an ancient Anglian kingdom stretching from the Tees to the Humber, and extending inland to the borders of the British realm of Strathclyde. With Bernicia it formed the kingdom of Northumbria. The union between Bernicia and Deira seems to have been rather unstable, for it was only under Edwin, Oswin, and other strong kings, either of Deiran or Bernician blood, that a real united Northumbria existed; and when the struggle for supremacy among the English kingdoms resulted in the triumph of Wessex, the two northern kingdoms were allotted to separate earls. Finally Deira became a kingdom under the Danes. The story seems to be authentic, that the slaves who attracted Gregory I. in the slave market of Rome, were from Deira.

Deism (Lat. *deus*, God), a philosophical system which, as opposed to Atheism (Gr. *a*, not, and *Theos*, God), recognizes a great First Cause; as opposed to Pantheism (Gr. *pan*, all, *Theos*), a Supreme Being distinct from nature or the universe; while as opposed to Theism, it

looks upon God as wholly apart from the concerns of this world. It thus implies a disbelief in revelation, as set forth in the Old and New Testaments, scepticism as regards the value of miraculous evidence, and an assumption that the existence of Deity can be proved by natural reason alone, unaided by spiritual or religious intuition. While Deism cannot be attributed to any one country or epoch, it seemed to have its fountain-head in England during the end of the 17th and first half of the 18th centuries.

Deissman, dīs'män, **Adolf,** German theologian: b. Langenscheid, 7 Nov. 1866. He was educated at Tübingen and Berlin, and has been professor of New Testament exegesis and criticism at the University of Heidelberg from 1897. He has published 'Johann Kepler und die Bibel' (1894); 'Bibelstudien' (1895); 'Neue Bibelstudien' (1897); 'Theologie und Kirche' (1900).

Deist, one who admits the being of a God, but denies the existence or even necessity of a divine revelation, believing that the light of nature and reason are sufficient guides in doctrine and practice; a believer in natural religion only; a freethinker.

Etymologically the words deist and theist are the same in meaning, only deist is from Latin and theist from Greek. Conventionally, however, they are widely different in import; the term theist being applied to any believer in God, whether that believer be a Christian, a Jew, a Mohammedan, etc., or a deist properly so called. A deist is, as the definition states, one who believes in God, but disbelieves in Christianity, or more generally in revelation.

The term Deists, or Freethinkers, is usually employed to designate a series of writers who appeared in England in the 17th and 18th centuries, and sought to establish Natural Religion upon the basis of reason and free inquiry, in opposition to all positive religions, and without reference to supernatural revelation. They were critical, if not hostile, in their attitude toward Scripture.

Deistic, or **Deistical,** pertaining to deism or the deists, containing the doctrines of deism or Natural Religion.

Also a term applied to a controversy which arose in England in the 17th and 18th centuries, between those who believed and those who disbelieved in revelation; the latter, however, not occupying the atheistic standpoint, but accepting as a settled point belief in a personal God. The first, in point of time, of the celebrated English deists was Lord Herbert of Cherbury, the publication of whose work, 'De Veritate,' which appeared in Paris in 1624, began the controversy. There followed, on the same side, Hobbes, Tindal, Morgan, Toland, Bolingbroke, Paine, and others. The standard work on the subject is the Rev. Dr. John Leland's 'Deistical Writers,' first published in 1754.

Dejanira, dĕj-a-nī'ra, in Greek mythology, a daughter of Œneus, king of Ætolia. Her father promised to give her in marriage to him only who proved to be the strongest of all his competitors. Hercules obtained the prize, and married Dejanira, by whom he had three children. When Nessus, a centaur, who had offered violence to Dejanira, was dying by a poisoned arrow shot from the bow of Hercules, she accepted from him the present of his tunic, which Nessus said had the power of reclaiming a husband from unlawful loves. Accordingly, when Hercules became enamored of Iola, daughter of the king of Œchalia, she sent him the centaur's tunic, which caused his death. Dejanira was so disconsolate at this event that she destroyed herself.

Déjazet, dā-zhā-zā, **Pauline Virginie,** French actress: b. Paris 30 Aug. 1797; d. 1 Dec. 1875. On the stage before she was five years old, she grew up playing children's and boys' roles with marvelous precocity of intelligence and grace. In 1821 she began to play at the Gymnase, but her greatest triumphs were won at the Théâtre du Palais-Royal, whither she betook herself in 1834. She left the boards in 1868, and the next year received a pension of 2,000 francs. See 'Lives,' by Lecomte (1866), Duval (1876).

De Kalb, Johann, yō'hän dĕ kälb, French soldier: b. Huttendorf, Bavaria, 29 June 1721; d. Camden, S. C., 19 Aug. 1780. He was educated in the art of war in the French army. In 1762 he visited the Anglo-American colonies as a secret agent of the French government. He was a brigadier in the French service, when, 7 Nov. 1776, he made with Franklin and Silas Deane an engagement to serve in the forces of the revolted colonies; and in 1777 he accompanied Lafayette to America. Congress appointed him a major-general 15 Sept. 1777, after which he joined the main army under Washington, and was active in the events near Philadelphia, which preceded the encampment at Valley Forge. He served in New Jersey and Maryland till, in April 1780, he was sent to reenforce Gen. Lincoln, then besieged in Charleston. He was second in command under Gen. Gates; and in the disastrous battle of Camden, 16 Aug. 1780, was at the head of the Maryland and Delaware troops, who maintained their ground till Cornwallis concentrated his whole force upon them. He fell in the charge upon his regiments before they gave way. He died at Camden three days afterward, and a monument was erected there to his memory in 1825, Lafayette placing the corner-stone.

De Kalb, Ill., city in De Kalb County, on the Chicago & Northwestern Railroad, 60 miles west of Chicago. The industries of the city are the manufacture of wire and other iron products, glove and shoe manufacturing and agricultural machinery. De Kalb has 3 banks with a combind capital of $350,000. The city is governed by a mayor and council of 10 members, elected for two years, and owns its own water-plant. The Northern Illinois State Normal School is located here. Pop. (1904) 6,000.

De Kay, Charles, American poet, grandson of Joseph Rodman Drake: b. Washington, D. C., 25 July 1848. He was educated at Yale and has been for many years the literary and art editor of the New York *Times*. His poems are mostly founded on themes from Oriental, classical and literary history. Among his works are: 'The Bohemian' (1878); 'Hesperus and Other Poems' (1880); 'The Vision of Nimrod' (1881); 'The Vision of Esther' (1882); 'The Love Poems of Louis Barnaval, by Charles De Kay' (1883).

Deken, dā'kĕn, **Agathe,** Dutch author: b. Amstelveen, near Amsterdam, 14 Nov. 1741; d. 14 Nov. 1804. She wrote a number of novels

with her friend Elizabeth Bekker (q.v.) and poems, among them 'Liederen voor den Boerenstand' and 'Liederen voor Kinderen.'

Dekker, Eduard Douwes, ēd'oo-ärd doo'-wes dek'kĕr, Dutch novelist, pseudonym 'Multatuli', b. Amsterdam 2 March 1820; d. Nieder-Ingelheim 19 Feb 1887. He spent several years in government service in the Dutch East Indies. His story, 'Max Havelaar' (1860), is a shocking accusation of wrongs and scandals against the Dutch administration of Java. He later published many satirical works on social, political, and philosophical questions, among them a volume of admirable 'Parables'; a novel, 'The Blessed Virgin'; a drama, and 'The School of Princes.'

Dekker, or **Decker, Jeremias de,** Dutch poet: b. Dort 1609 or 1610; d. Amsterdam 1666. His first published poetical work was 'The Lamentations of Jeremiah'; and several others which soon followed it were also translations. His 'Love of Gold,' a powerful satire, and his 'Goede Vrydag,' or the 'Passion of Christ,' as well as his lyric poems, are still in high estimation; and his 'Epigrams' ('Puntdichten') are, beyond dispute, the best of the kind which the literature of that period produced. The best edition of his poems, accompanied with a biography, was published by Brouerius van Nidek (1726).

Dekker, or **Decker, Thomas,** English dramatist: b. London about 1570; d. after 1637. He is first mentioned as a theatrical writer in 1597. He was one of the literary antagonists of Ben Jonson, who satirized Dekker in his 'Poetaster,' and the latter took his revenge in his 'Satiromastix.' He appears to have lived from hand to mouth, and been often in difficulties, imprisonments for debt being almost the only record, besides his works, that is left of him. Among his writings may be mentioned the 'Seven Deadly Sinnes of London,' a moral tract; the 'Double P. P.' a violent tract against the Catholics; 'A Knight's Conjuring,' in which he introduces Chaucer, Spenser, and many other dead poets; 'The Gull's Hornbook,' valuable as a picture of the time. Besides his own plays he co-operated with Massinger in the 'Virgin Martyr,' and with Ford in the 'Sun's Darling,' a moral masque; the 'Pleasant Comedie of Old Fortunatus' (1600); and 'The Honest Whore' (1604); are among the most esteemed of his dramas. The number of Dekker's plays is about 28, of his tracts about 25.

De Ko'ven, Anna Farwell, American novelist: b. 19 Nov. 1860. She was graduated at Lake Forest University in 1880, and married to Louis Reginald De Koven (q.v.) May 1884. She is the author of 'A Sawdust Doll' (1894); 'An Iceland Fisherman,' a translation from Pierre Loti (1889); 'By the Waters of Babylon' (1901).

De Koven, Henry Louis Reginald, American composer: b. Middletown, Conn., 3 April 1859. He was graduated at Oxford in 1879 and studied music in the leading cities of Europe. His operettas have had great success, notably: 'The Begum'; 'Don Quixote'; 'Robin Hood'; 'The Fencing Master'; 'The Three Dragoons'; 'Maid Marian'; etc.

De Koven, James, American Episcopal clergyman and educator: b. Middletown, Conn., 19 Sept. 1831; d. Racine, Wis., 19 March 1879. He was educated at Columbia College and at the General Theological Seminary in New York. After his ordination to the priesthood in 1855, he took a pastoral charge at Delafield, Wis., and at the same time became principal of the preparatory school for Nashotah Seminary, founded two years earlier. In 1859 this became Racine College, and De Koven its first warden. He soon acquired a marked influence throughout the West, both in educational and ecclesiastical matters, in the latter taking up and carrying forward the teachings of the Oxford Movement. His most prominent appearance in this connection was in the General Convention of 1871, at a time when the ritual controversy ran very high. In bold and outspoken terms, which have become historical, he proclaimed and defended his position, with a marked effect on the legislation under discussion. When, however, in 1875, he was elected Bishop of Illinois, a considerable majority of the standing committees of the other dioceses refused to confirm his election, regarding his views as dangerous. He labored diligently for the upbuilding of Racine College, where he remained until his death. The published volume of his sermons (1880) contains a preface by Mr. Dix, which gives some idea of his commanding position in the church life of his time.

De Kroyft, dē kroift, **Susan Helen,** American author: b. Rochester, N. Y., 29 Oct. 1818. She was graduated at Lima College, New York, 1843, and married Dr. William De Kroyft, of Rochester, who was killed on his wedding day by a fall from a carriage. Mrs. De Kroyft shortly afterward lost her sight and has since then remained blind. Among her works are: 'Little Jakey' (1871); 'Darwin and Moses,' a lecture; 'A Place in Thy Memory' (1849); and 'Mortara.'

Del Credere, dĕl krĕd'ĕ-rē, an Italian mercantile phrase expressing a guarantee or warranty, given by factors, brokers, or mercantile agents, who, for an additional commission, become bound not only to transact business for their employers, but also to guarantee the solvency of the persons to whom the goods are sold, or with whom business is done. This additional commission is known as a del credere commission. The term has come into general use in international commerce, and is recognized in the common law system of England and America.

De la Beche, dē lä bāsh, Sir **Henry Thomas,** English geologist: b. near London 1796; d. there 13 April 1855. In 1817 he became a Fellow of the Geological Society, of which he was afterward made secretary, and eventually president in 1847. Among his works are a 'Manual of Geology' (1831); 'Researches in Theoretical Geology' (1834); and a 'Geological Observer' (1853). He was founder of the Geological Museum and of the School of Mines. In 1848 he received the honor of knighthood.

Delaborde, Henri François, ŏñ-rē fränswä dē lä-bôrd, Count, French general: b. Dijon 21 Dec. 1764; d. 3 Feb. 1833. He distinguished himself in the Republican armies; fought through the whole of the Napoleonic wars, and was ennobled in 1807.

Delacroix, Ferdinand Victor Eugène, fĕr-dē-nänn vēk-tōr ē-zhān dē-lä-krwä, French painter: b. Charenton-St.-Maurice, near Paris,

26 April 1799; d. Paris 13 Aug. 1863. His first painting, 'Dante and Virgil in the Infernal Regions,' attracted much notice in the exhibition of 1822. This picture displayed a wide departure from the coloring and manner of the school of David, and accordingly it gave rise to enthusiastic praise on the one side; on the other to contemptuous depreciation, but everywhere to wonder. His 'Massacre in Scio' (1824) was a formal declaration of war against the school of the classicists, who named it a Massacre of Painting. These were followed by the 'Execution of the Doge Marino Falieri' (1826); the 'Death of Sardanapalus' (1827); and the 'Murder of the Bishop of Liège' (1830)—pieces painted with fire and vigor. His sympathy with the revolutionary party was shown by his celebrated picture of the 'Goddess of Liberty at the Barricades.' In 1831 he joined the embassy sent by Louis Philippe to the Emperor of Morocco. To this journey we are indebted for several pictures remarkable for their vivid realization of Oriental life as well as their masterly coloring. They are the 'Jewish Marriage'; 'Muley Abderrhaman With His Body-guard'; 'Algerian Ladies in Their Chamber'; 'Moorish Soldiers at Exercise'; and the several scenes of common life. In spite of his undoubted genius Delacroix failed in gaining popularity with the general public. He was commissioned not only with the decoration of public buildings, such as the Luxembourg Palace, the town-hall, and the Louvre, but large paintings were executed by him for the Parisian churches, and the historical museum of Versailles contains two of his masterpieces—the 'Battle of Taillebourg' (1838), and the 'Taking of Constantinople by the Crusaders' (1841). In 1857 the Academy elected him a member of their body. Delacroix was an artist of great versatility; mythology, legend, history, and poetry by turns furnished him with subjects, and in addition he painted portraits, allegorical and genre pictures, hunting scenes, etc.; but all exhibit at once his strength and his weakness—brilliant coloring and incorrect drawing.

Del'afield, Francis, American physician: b. New York 3 Aug. 1841. He was educated at Yale, and the New York College of Physicians and Surgeons, in which latter institution he has since been a professor of pathology and practice of medicine. He has published 'Handbook of Pathological Anatomy'; 'Handbook of Post Mortem Examinations and Morbid Anatomy'; 'Studies in Pathological Anatomy.'

Delafield, Richard, American military engineer: b. New York 1 Sept. 1798; d. Washington, D. C., 5 Nov. 1873. He graduated from West Point in 1818, and was draughtsman to the American boundary commission, appointed under the treaty of Ghent. In 1819–38 he was assistant engineer in the construction of Forts Monroe and Calhoun; had charge of the improvements on the Mississippi, and of the building of the Cumberland road and the construction of Fort Delaware. In 1838 he was appointed superintendent of the Military Academy at West Point, and held the position seven years at that time, and again from 1856 to 1861, when he was relieved at his own request. In 1855 he was senior member of a commission sent to the Crimea to report on modern methods of warfare; he prepared the report which was published by Congress in 1860. During the Civil War he assisted in organizing and equipping the New York troops and had charge of the construction of fortifications in New York harbor. In 1864 he was made chief of engineers, and retired in 1866 with the rank of major-general.

Delago'a Bay, a bay on the southeast coast of Africa, in Portuguese territory, partly enclosed by Inyack peninsula. It is about 70 miles long and 20 miles wide. Though crossed at its entrance by a shifting bar it is accessible to vessels of the largest class, and is the finest harbor on the east coast of Africa. Several large rivers flow into it. See PORTUGUESE POSSESSIONS IN AFRICA.

De la Hire, Philippe, fē-lēp dė lȧ ēr, French mathematician: b. Paris 18 March 1640; d. there 21 April 1718. He was a member of the Academy of Sciences and professor at the College of France. His chief work was in pure mathematics, but he was also an astronomer. Many of his papers are in the Memoirs of the Academy of Sciences. Among his writings are 'Nouvelle Méthode de Géométrie'; 'Sectiones Conicæ'; 'Mémoire sur la Epicycloid' (1694); and 'Mémoire sur les Conchoids' (1708).

Delambre, Jean Baptiste Joseph, zhŏñ bäp-tēst zhō-zĕf dė läñ-br, French astronomer: b. Amiens, France, 19 Sept. 1749; d. Paris 19 Aug. 1822. In 1790, eight years after the discovery of Uranus, Delambre published the tables of that planet, although in that period it had but performed a small part of its eighty years' course. He also constructed tables of Jupiter and Saturn, and of the satellites of Jupiter, which, with several treatises, procured him a reception into the National Institute. In 1802 Napoleon appointed him inspecteur-général des études, which post he resigned when chosen perpetual secretary of the class of mathematical sciences (1803). His first tables of the sun were published in 1792; in 1806 appeared his new ones. In 1807 he succeeded Lalande in the Collège de France, and wrote his 'Traité d'Astronomie théorique et pratique' (1814); 'Histoire de l'Astronomie du moyen âge' (1819); Histoire de l'Astronomie moderne' (1821); 'Histoire de l'Astronomie du 18me Siècle.'

Delamination. See EMBRYOLOGY.

De Lancey, Edward Floyd, American historical writer: b. Mamaroneck, N. Y., 23 Oct. 1821; d. Ossining, N. Y., 7 April 1905. He was author of 'Documentary History of New York' (1851); 'The Capture of Fort Washington the Result of Treason' (1877); 'Origin and History of Manors in the Province of New York' (1866).

De Lancey, William Heathcote, American Protestant Episcopal bishop: b. Westchester County, N. Y., 8 Oct. 1797; d. 1865. He was graduated at Yale College in 1817; studied theology and entered the Episcopal ministry in 1822. He was secretary of the house of bishops in the general convention of the Episcopal Church of the United States 1823–9. Upon the reorganization of the University of Pennsylvania in 1828, he was chosen provost of that institution, and remained provost five years. In 1839 he became bishop of the diocese of Western New York.

Deland, Ellen Douglas, American writer for young people: b. Lake Mahopac, N. Y., 3

Sept. 1850. She was educated in New York but until very recent years has lived mainly in [illegible]. Her published books include 'Dr. Legh' (1887); 'Malvern' (1890); 'In the Old Herrick House' (1897); 'A Successful Venture' (1897); 'Alan Ransford' (1898); 'Katrina' (1898); 'Three Girls of Hazelmere' (1903).

Deland, Margaret Wade Campbell, American novelist, b. Allegheny, Pa., 23 Feb. 1857. She was educated at the Cooper Union, New York, and for a time taught drawing. In 1880 she married L. F. Deland and has since lived in Boston. 'John Ward, Preacher' (1888), her first novel, attracted wide notice. Other works are 'The Old Garden and Other Verses' (1887); 'Sydney' (1890); 'Florida Days,' a collection of sketches of travel; 'The Story of a Child' (1892); 'Mr. Tommy Dove and Other Stories' (1893); 'Philip and His Wife' (1894); 'The Wisdom of Fools' (1897); 'Old Chester Tales' (1901); 'Good for the Soul.'

De Land, Fla., town, county-seat of Volusia County, on the Jacksonville, Tampa & Key West Railroad; about 55 miles southwest of Saint Augustine. It is a favorite health resort, noted for its sulphur springs. The John B. Stetson University, a Baptist institution, was established here in 1887. Pop. 1,510.

Delane, John Thaddeus, English journalist: b. London, 11 Oct. 1817; d. 22 Nov. 1879. After leaving Oxford he studied life in many forms, walked the hospitals, was called to the bar, and reported in the House of Commons. In May 1841 he became editor of the London *Times*. For 36 years Delane held this post. Under his editorship the *Times* attained a prodigious circulation, and an influence unparalleled in the history of journalism. He merged his personality in his paper, and the history of his later life is the history of the extraordinary influence wielded by the leading journal. He was singularly shrewd in weighing public opinion, possessed remarkable foresight, and seldom made a mistake. He resigned the editorship in 1877.

Del'ano, Columbus, American lawyer and politician: b. Shoreham, Vt., 5 June 1809; d. Mount Vernon, Ohio, 23 Oct. 1896. He studied law at Mount Vernon, was admitted to the bar in 1831, and shortly after elected prosecuting attorney of the county. He was elected member of Congress in 1844 and voted against the declaration of war in Mexico; he was again elected to Congress in 1864 and 1866. He was delegate to the Republican conventions of 1860 and 1864, and member of the State Legislature in 1863. In President Grant's first administration he was appointed commissioner of internal revenue, and reorganized the department, putting it on an excellent financial footing. In 1870 he became secretary of the interior, resigning in 1875, and retiring from public life. He was one of the trustees of Kenyon College and endowed its preparatory department.

Dela'ny, Mary Granville, English writer: b. Coulston, Wiltshire, 14 May 1700; d. Windsor 15 April 1788. She married first, in 1718, Alexander Pendarves (1650–1724); and secondly, in 1743, Swift's friend, the Rev. Patrick Delany (1685–1768). After his death she lived chiefly in London. Her much-admired "paper mosaics," or flower-work, have long since faded; but she is remembered through her patronage of Miss Burney, and by her 'Autobiography and Correspondence' (1861–2), with its gossip of the court and the literary society of her day.

Delaplanche, Eugène, French sculptor: b. Paris 1836; d. there 1891. He was a pupil of Duret, received the grand prize of Rome, 1864, and the medal of honor 1878. Among his works are: 'Child and Turtle'; 'Eve Before the Fall'; 'Saint Agnes'; 'Maternal Education'; 'Harmony'; 'Africa,' in bronze; 'Music'; 'Virgin of the Lilies,' in the Luxembourg; 'Aurora,' also in the Luxembourg; 'Circe'; The Dance'; and a statue of 'Auber' for the opera house. He is noted for grace and nobility of treatment and refinement of style.

De Lara, Isidore (COHEN), English composer: b. Dublin. He was a pupil of Muzzucato in Milan, and gained great popularity in England by singing his own compositions, especially drawing-room songs. His opera 'Moina' was given at Monte Carlo in 1891, and his 'Amy Robsart,' with libretto by Augustus Harris, was produced at Covent Garden, London, in July 1893, but the music was not notable. The music of his 'Messaline' has been deemed lacking in originality. The libretto was by Armand Silvestre and Eugene Morand. This opera was produced at Monte Carlo 21 Feb. 1899; in London 1899 and 1900, with Calvé in the leading part, and in New York in 1902 with Calvé and Alvarez.

De la Ramée, dė lä rā mā, Louise. See OUIDA.

De la Rey, Jacob Hendrick, Boer general: b. Lichtenburg District of the Western Transvaal 1849. He gained distinction in his first command against the Basutos, when very young, and served two years in the Volksraad, supporting Joubert. He commanded the Lichtenburg burghers at the outbreak of the Boer-British war, 1899–1902, which force served later in Cronje's western column. He distinguished himself at Magersfontein; in the retreat before Lord Roberts, and at Nooitgidachet 1900, where he captured 500 English troops. He captured Lord Methuen 7 March 1902 with many of his men, but released him on account of not being able to treat his wounds, lacking hospital facilities; an instance of his noted humaneness. He was very popular with the Boers and his military skill was greatly respected by his foes. He served on the Boer committee which arranged for peace, and, later, on the deputation visiting Europe and the United States to raise funds for the Boers that they might continue their occupations at home.

De la Rive, Auguste, Swiss physicist: b. Geneva 9 Oct. 1801; d. Marseilles 28 Nov. 1873. He received the appointment to the chair of natural philosophy in the Academy at Geneva at the age of 22. First devoting himself to the study of the specific heat of gases, and of the observation of the temperature of the earth's crust, he soon turned his complete attention to electricity, making original discoveries in connection with magnetism, electrodynamics, the relation between magnetism and electricity, and the properties of the voltaic arc, and presenting new theories upon the subject of the aurora borealis. He discovered the process of electro-gilding, for which he received the grand prize of 3,000 francs from

the Académie of Sciences 1842, becoming one of the eight foreign associates of the Académie in 1864. His chief work was a complete treatise on electricity in three volumes, which was translated into several languages, and was considered of the highest authority upon the subject.

Delaroche, Hippolyte, ē-pō-lēt dē-lä-rōsh, (familiarly styled PAUL), French painter: b. Paris 17 July 1797; d. there 4 Nov. 1856. He entered the studio of Baron Gros, and rapidly rose to eminence as one of the greatest of modern painters in France. His subjects are principally taken from French and English history. Among others may be mentioned, 'St. Vincent de Paul Preaching before Louis XIII. on Behalf of Deserted Children'; 'Joan of Arc Interrogated in Prison by Cardinal Beaufort'; 'Flora Macdonald Ministering to the Pretender after the Battle of Culloden'; the 'Death of Queen Elizabeth,' a work greatly admired by French and generally reprobated by English critics; 'A Scene of the St. Bartholomew Massacre'; 'The Children of Edward IV. in the Tower'; 'Cardinal Richelieu conducting Cinq Mars and De Thou up the Rhone to Execution'; 'Cromwell Contemplating the Dead Body of Charles I.,' one of Delaroche's most exalted efforts; the 'Execution of Lady Jane Grey,' and the 'Death of the Duke of Guise.' What he considered his *chef-d'œuvre*, was the pictorial decoration of the hemicycle of the Palais des Beaux Arts, on which he was engaged from 1837 to 1841. In this composition Delaroche has sought to illustrate the history of art from the remotest period to the present day, by representing, in one compartment, the great artists of all ages, painters, sculptors, and architects. Notwithstanding the number of persons depicted (upward of 80), and the diversities of figure and costume, the whole presents a group in perfect harmony, with a coloring at the same time quiet and rich, and a correctness of drawing which leaves nothing to be desired. It has often been objected to Delaroche that the accessories of his pictures are finished with such minuteness as to divert the attention from the main subject. His signal merits consist in correct drawing, brilliant and harmonious color, and great distinctness and perspicuity in treatment, rendering the story of his pictures at once intelligible.

De la Rue, Warren, English inventor and physicist: b. Island of Guernsey 18 Jan. 1815; d. London 22 April 1889. He was educated in Paris and followed his father's business, that of manufacturing paper wares. For this he invented many new processes and machines. He is best known for his application of photography to astronomy. He was a member of the International Electrical Congress at Paris in 1861, president of the Royal Astronomical Society, and held other posts of honor. His reports of original observations in chemistry, astronomy, and physics are of the greatest value.

Delaunay, Charles Eugène, shärl ė-zhān dė-lō-nā, French astronomer: b. Lusigny, Aube, 9 April 1816; d. Cherbourg 5 Aug. 1872. He studied at the Ecole Polytechnique, becoming a mining engineer. He taught mechanical engineering at the Polytechnique and on the Faculty of Sciences of Paris, and was made a member of the Institute in 1855. In 1870 he became director of the Paris Observatory. Among his works are: 'On a New Analytical Theory of the Movement of the Moon'; 'Theory of the Tides'; 'Slowing of the Rotation of the Earth'; 'The Seasons'; and a 'Report on the Progress of Astronomy' (1867).

Delaunay, Jules Elie, zhül ā-lē, French figure and portrait painter: b. Nantes 12 June 1828; d. Paris 5 Sept. 1891. He received the Grand Prix de Rome in 1856; the first-class medal at the Paris Exposition of 1878; and at that of 1889 was awarded the medal of honor. He was made an officer of the Legion of Honor and a member of the Institute. His portraits are considered masterpieces. His 'Diana' is in the Luxembourg Gallery, Paris, and the 'Death of the Centaur Nessus,' in the Museum at Nantes.

Delaunay, Louis Arsène, loo-e är-sān, French actor: b. Paris 21 March 1826; d. Versailles 22 Sept. 1903. He made his début in Oct. 1846, at the Odéon. In 1848 he acted at the Théâtre Français in the role of Durante, becoming secretary to the theatre in 1850. Till he retired (1887), he was one of the most accomplished actors on the French stage. He has found some of his greatest parts in the plays of Hugo, Pailleron, De Musset, and Augiers.

Delavan, Wis., a city of Walworth County near Delavan Lake, and on the Chicago, Milwaukee & St. Paul Railroad. It has some manufacturing interests, including dairies. It is the seat of the State institution for the education of the deaf; and on account of mineral springs in the vicinity and the lake is a place of summer resort and the site of a summer school. Pop. (1900) 2,244.

Delavigne, Jean François Casimir, zhŏń fräń-swâ käz-ē-mēr dė-lä-vēn-yė, French poet and dramatist: b. Havre 4 April 1793; d. Montmorency 11 Dec. 1843. He was educated at the Lycée Napoléon, Paris, and in 1811 composed a dithyrambic on the birth of the King of Rome, which attracted considerable attention, and procured him, from Count François de Nantes, a situation in the office of indirect taxes. At the Restoration he published a set of elegies entitled 'The Messenians,' which deplored the faded glories of France. He produced in 1819 his tragedy of 'The Sicilian Vespers'; 'The Comedians' appeared in 1820, and the tragedy of 'The Paria' in 1821. Of his other plays which followed these may be mentioned: 'The School of Old Men'; 'Marino Faliero' (1829); 'Louis XI.,' founded on Commines' 'Memoirs'; 'Quentin Durward'; 'Don John of Austria.' His hymns, 'The Parisienne' and 'The Varsovienne,' and the ballad 'The Toilette of Constance' are among his more popular poetical pieces. He became in 1825 a member of the Academy.

Delaware ("the Diamond State"), the smallest but one and the least populous of the 13 original States; southernmost of the Middle States; 96 miles long by 9 to 37 broad, 2,050 square miles in area, 1,960 square miles of land. It is bounded east by the Atlantic, Delaware Bay, and Delaware River, the latter separating it from New Jersey; north by Pennsylvania, the boundary being a semicircle struck 12 miles from New Castle court-house; west and south by Maryland, arbitrary lines at a right angle. The broadest part is about 25 miles of the

extreme south, where it narrows almost regularly to the north. Capital, Dover, near the centre. Pop. (1903) about 100,000.

Topography.— The whole peninsula between Chesapeake Bay and the Delaware River estuary and Bay proper, between Maryland and Delaware, is part of the Atlantic coastal plain; flat, sandy, and with frequent swamps, of which there are some 70 square miles in southern Delaware. North of New Castle, where the Piedmont uplands sink down to it, there is a low, undulating country; and behind Wilmington, the divide between Brandywine and Christiana creeks becomes a ridge rising to a hill 80 feet high, the most elevated ground in the State, with pleasing scenery along the streams. South of this, a marshy and sandy ridge nowhere over 70 feet high runs through the State northwest to southeast, forming the watershed between the bays, but following the line of the Atlantic coast about a dozen miles inland. In the southwest, therefore, the part of the State west of the ridge is bulky enough to create some fair-sized creeks, all feeding the Nanticoke in Maryland. The other streams are all petty creeks except in the extreme north, where Brandywine and Christiana creeks flow southeast from Pennsylvania, unite a half mile from the Delaware, and form a deep-water estuary which constitutes Wilmington harbor, which contributes to the greatness of the city. The only other good harbors on this marshy coast are at New Castle and Lewes, the latter protected by the Delaware breakwater at Cape Henlopen. On the southeast coast are two considerable but shallow lagoons called Rehoboth Bay and Indian River Bay, communicating at the outer edge, and separated from the sea by a sandspit pierced by Indian River Inlet, through which and on them vessels under six feet draft can navigate. Delaware Bay itself has 35 to 75 feet of water in mid-channel.

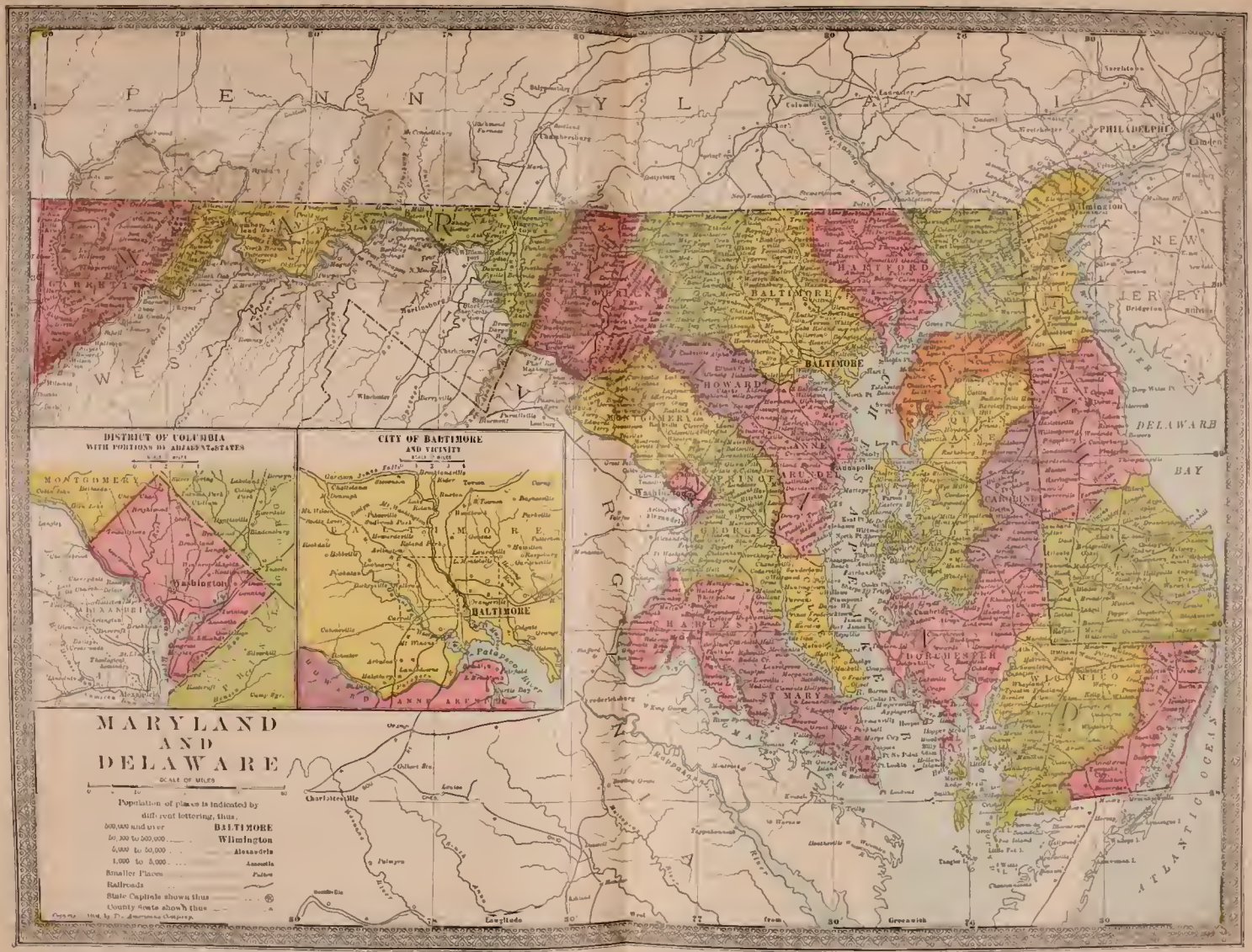
Natural Products.— The State has three geological divisions: Cretaceous in the north, succeeded southward by Tertiary and post-Tertiary, or Alluvial. The most valuable minerals, naturally, are found in the upper levels in the north. Near Wilmington are granite quarries which turn out over $600,000 of products a year; kaolin or porcelain clay beds, among the first worked in the United States, and which in 1900 produced 10,500 tons, valued at $91,500; and other clays for brick and terra-cotta. There is found also glass sand, feldspar, shell marl in the greensand districts, and bog-iron ore in all the swamps. The natural woods of the State are valuable, but most of them have been cut away (including the white-oak for shipbuilding once plentiful) except the forests of cypress, hackmatack, and other evergreen in the swamps. There is much shooting of wild ducks and teal, wild geese, etc., and some terrapin are caught.

Climate and Rainfall.— Delaware naturally has a range of temperature intermediate between the severe extremes of New England and the heat of the South; and still further tempered by the sea breezes which alternate with the southwest winds in summer. The northwest winds of winter and spring are probably not more severe than of old, but the delicate crops, like peaches, have furnished a more costly thermometer, and the precariousness of the spring warmth is felt. On an average, the autumn begins about 1 April, and the autumn frosts toward the middle of October; the average temperatures run from about 85° in August to 25° in January. The rainfall is from 40 to 45 inches annually, the heaviest on the coast; and droughts never become ruinous. In the swampy districts and southern lowlands there is some malaria; but as a whole the State has a good sanitary record.

Soils and Agriculture.— The soil of the State steadily lightens southward from a heavy rich clay in the north, and for some miles inland along the Delaware River, to loamy clay and loam in the centre, and sand with some loam in the south. The north is the region of cereals and hay; the centre and south, of fruits, berries, grapes, and vegetables; and the south especially of peaches and strawberries. The State is one immense market garden and orchard for the North, especially the great cities not far away,— New York, Philadelphia, and Baltimore. New Jersey, Maryland, and Delaware raise three fourths of all the peaches, berries, and small fruits sold in these markets. Delaware in the popular mind is identified with the peach crop, which in good years has yielded 4,000,000 baskets or crates; but a considerable percentage of the trees have been injured and the crops frequently blasted by the late spring frosts in recent years, and there is a growing tendency to replace entire reliance on this precarious crop by market gardening and even cereals. Still, the railroad freightages in the summer of 1902 were estimated at 2,351,460 baskets, besides 362,345 baskets of pears. The other orchard fruits together exceed the peaches; the apple crop especially is very large. Of the market gardening, the tomato is by far the principal crop, and is exceeded only by that of Maryland and Indiana; 16,000 acres were planted in 1902, and 750,670 cases sent out, of 24 cans each, or 18,160,000 cans. A surprising development, however, in which it is alone among the eastern States, has been in the wheat crop for the past two decades: its acreage in 1900 was 118,740, or nearly one sixth of all the improved land, against 87,530 in 1880. In 1902 it raised 1,792,006 bushels. The first place in acreage, however, belongs to corn, 187,134 in 1902, or about one fourth of all; the yield was 5,230,732 bushels. Third was hay, 76,373 acres, 83,247 tons. There were also 6,000 acres of potatoes, with a yield of 471,000 bushels, or 78.5 bushels to the acre, against 48 in 1900. The dairy interest has enormously increased in the decade: in 1900 there were 21 creameries and one cheese factory, against five creameries in 1890; the capital had increased from $19,085 to $88,155, and the value of products from $124,780 to $252,890.

Outside of its one great manufacturing city, the agricultural interest is supreme; no other State compares with it in the proportion of land under cultivation. Of the total land surface of 1,254,000 acres, 1,060,228 was in farms in 1900, and 754,010 were improved, or 60 per cent of the whole soil. Less than half the farmers own their own farms, and nearly the same number work on shares. The thin soil of the south— which reduces the average value of farms from $45 in the north to $12— has also made heavy use of fertilizers necessary. Stock farming is not much practised, save milch cows.

Manufactures.— While Delaware as a State is predominantly agricultural, the enormous relative magnitude of its one great city, Wilming-


DISTRICT OF COLUMBIA
WITH PORTIONS OF ADJACENT STATES
CITY OF BALTIMORE
AND VICINITY
MARYLAND
AND
DELAWARE
SCALE OF MILES
Population of places is indicated by
different lettering, thus.
500,000 and over BALTIMORE
50,000 to 500,000 Wilmington
5,000 to 50,000 Alexandria
1,000 to 5,000 Annapolis
Smaller Places Patuxent
Railroads
State Capitals shown thus
County Seats shown thus
PENNSYLVANIA
WEST VIRGINIA
VIRGINIA
NEW JERSEY
DELAWARE BAY
ATLANTIC OCEAN
Washington
BALTIMORE
Annapolis
Fredericksburg
Charlottesville
Lexington
Harrisburg
Philadelphia
Wilmington
Camden
Trenton
Bridgeton
Dover
Salisbury
Easton
Cambridge
Centreville
Chestertown
Elkton
Havre de Grace
Frederick
Hagerstown
Cumberland
Westminster
Ellicott City
Towson
Baltimore
Howard
Montgomery
Prince George
Anne Arundel
Queen Anne
Caroline
Talbot
Dorchester
Somerset
Wicomico
Worcester
Kent
New Castle
Cecil
Harford
Carroll
Frederick
Washington
Allegany
Garrett
Patapsco
Patuxent
Potomac
Susquehanna
Chesapeake
Delaware
Greenwich
Lewes
Rehoboth
Dover
Smyrna
Milford
Seaford
Laurel
Georgetown
Millsboro
Selbyville
Ocean City
Salisbury
Crisfield
Pocomoke City
Snow Hill
Berlin
Princess Anne
Onancock
Accomac
Eastville
Cape Charles
Cape Henry
Norfolk
Portsmouth
Suffolk
Smithfield
Hampton
Newport News
Williamsburg
Yorktown
Gloucester
Tappahannock
Urbanna
Saluda
Middlesex
Essex
King and Queen
King William
Caroline
Spotsylvania
Stafford
Prince William
Fairfax
Loudoun
Fauquier
Rappahannock
Culpeper
Orange
Madison
Greene
Albemarle
Nelson
Amherst
Campbell
Appomattox
Buckingham
Cumberland
Powhatan
Chesterfield
Henrico
Hanover
Goochland
Fluvanna
Louisa
Spotsylvania
Richmond
Petersburg
Hopewell
City Point
Dutch Gap
Bermuda Hundred
Chester
Manchester
Falling Creek
Bermuda
Appomattox
Lynchburg
Danville
Pittsylvania
Halifax
Mecklenburg
Brunswick
Greensville
Sussex
Surry
Isle of Wight
James City
New Kent
Charles City
Prince George
Dinwiddie
Nottoway
Lunenburg
Charlotte
Prince Edward
Cumberland
Buckingham
Albemarle
Fluvanna
Goochland
Hanover
Caroline
Spotsylvania
Stafford
Prince William
Fairfax
Loudoun
Fauquier
Rappahannock
Culpeper
Orange
Madison
Greene
Albemarle
Nelson
Amherst
Campbell
Appomattox
Buckingham
Cumberland
Powhatan
Chesterfield
Henrico
Hanover
Goochland
Fluvanna
Louisa
Spotsylvania
Richmond
Petersburg
Hopewell
City Point
Dutch Gap
Bermuda Hundred
Chester
Manchester
Falling Creek
Bermuda
Appomattox
Lynchburg
Danville
Pittsylvania
Halifax
Mecklenburg
Brunswick
Greensville
Sussex
Surry
Isle of Wight
James City
New Kent
Charles City
Prince George
Dinwiddie
Nottoway
Lunenburg
Charlotte
Prince Edward

ton (containing two fifths of its entire population), and the industries concentrated around it, makes the northern end a very important manufacturing section. The great natural advantages of the spot were early utilized; the deep harbor for building the largest ships, the 100-foot falls of the Brandywine four miles from its mouth, and the proximity to the great coal and iron fields of Pennsylvania, Maryland, and Virginia. All branches of iron and steel manufacturing are carried on to an immense extent. The first iron sailing vessel in the country was built in 1854 in Wilmington, which had previously been noted for building wooden ships; and up to 1900 that city had built over 400 iron and steel steamers, more and of greater aggregate tonnage than any other single port in the United States. The two companies there built 13 such vessels in 1900. Pumping and mining apparatus and paper-making machinery are famous specialties; in 1817 the first endless-sheet paper machine was set up in Wilmington, revolutionizing the business. Its manufactories of steam and street cars, machine tools, engines, boilers, etc., are known all over the globe. Next to iron and steel comes the dressing and manufacture of leather, in which Delaware stood sixth of the United States in 1900, against ninth in 1890. Wilmington has one of the largest morocco plants in the world. The flouring-mill industry comes next, but is slightly falling off, as this business tends to go West; then the manufacture of fertilizers; and next the canning business; both of which are increasing immensely, and more than doubled in the decade. There is a considerable textile manufacture, but not as much as formerly. The most interesting concern is the great powder works of the Du Ponts on the Brandywine, a few miles from Wilmington, the oldest and largest of the kind in the country. The company was founded by the French exile, Du Pont de Nemours, in 1802, and till 1902 remained a family preserve; in that year it was turned into the E. J. Du Pont de Nemours Company, with a capital of $20,000,000. There is a petroleum refinery at Marcus Hook.

Fisheries.— The oyster, shad, and sturgeon fisheries of the State are of considerable magnitude, the whole fish catch being worth some $250,000 a year and employing about 2,500 men.

Commerce and Transportation.— The Delaware district reports over $750,000 a year of exports and imports, and clears about 250 vessels. Wilmington, Lewes, and New Castle are ports of entry, and the former is a customs district. It has some direct foreign commerce, a steamer line to New York, and coasting lines to Philadelphia and down the bay; besides communication with Baltimore by the Delaware & Chesapeake Canal (see CANALS), 13½ miles long, 66 feet wide, and 10 feet deep, completed in 1829. The great Delaware Breakwater opposite Lewes was begun the year before, and completed 1869; it cost over $2,000,000, and forms an artificial harbor some 300 acres in extent, with 24 feet of water. (See DELAWARE BREAKWATER.) Railroad facilities are excellent; there are about 360 miles of main track in the State. The one great line, which serves nearly all the State, is the Philadelphia, Baltimore & Washington, whose main line runs through it lengthwise from Wilmington to Delmar at the southern boundary, where it connects with another to Cape Charles and Norfolk; its Delaware, Maryland & Virginia branch in the southeast serves that portion. Other branches run from it. In the north, the Baltimore & Ohio, and the Philadelphia, Wilmington & Baltimore division of the Pennsylvania system, parallel each other through Wilmington and the line to Philadelphia and Baltimore. Queen Anne's Railroad runs across the centre to Chesapeake Bay.

Banks, etc.— There are 20 national banks in Delaware, with a capital of some $2,250,000, and deposits of about $7,000,000; reserve, about $2,500,000. There are also two State banks, with $600,000 capital, deposits of $1,750,000, and resources of $3,000,000; and two mutual savings banks, with deposits of over $5,000,000. In these regions, however, the building and loan association takes largely the place of the northern savings bank. There are several local fire and mutual life-insurance societies.

Churches.— The strongest religious denomination is the Methodist Episcopal; next in order of size are the Presbyterian, Protestant Episcopal, Baptist, Roman Catholic, Quakers, and Lutherans; and there are several smaller ones. There are about 1,200 church organizations, and an enrolment of toward 50,000 members. Wilmington is the seat of the Roman Catholic diocese of that name, embracing Delaware and part of the southern peninsula, and of the Protestant Episcopal diocese of Delaware.

Charities and Penal Institutions.— There is a State Insane Hospital, with about 350 inmates. There being no State institutions for the feeble-minded, deaf-mutes, or the blind, the statutes permit five of the last two classes from each county, and 14 imbecile children from the State, to be maintained at institutions of other States; and they are so kept at Philadelphia and Washington. The Ferris Industrial School for Boys at Wilmington has about 75 inmates. There is a public workhouse in Newcastle County, with indeterminate sentence. The whipping-post is a punishment for minor offenses.

Education.— The public schools are supported by local taxes; by a State distribution of the income of a fund now some $580,000, and of the proceeds of certain taxes, both yielding about $140,000 a year, devoted entirely to paying teachers' salaries and furnishing free text-books; and by an annual appropriation beyond this, fixed by the constitution at a minimum of $100,000. The teachers number about 640 females and 210 males; the salaries of the former averaging about $34 a month and of the latter $36.60. The school year is longer and schools much more developed in the Wilmington district than elsewhere; and this manufacturing section has been prevented from greatly improving the system by its under-representation in the State government, due to an unfair apportionment. Of about 50,000 children in the State, between 5 and 18, something over half attend school for six months and more, and about 4,000 others for shorter periods; it is notable that the attendance of foreign-born children, and native-born of foreign parents, is much higher than that of the pure natives, owing to the former being concentrated in Wilmington, where the schools are best. There are separate schools for the colored population, and a State agricultural college for them at Dover, which graduates three or four annually. There are 14 academies, seminaries, and high schools; and one college, Delaware College at Newark (coeducational), with scientific

and normal departments. It had 114 students in 1902. Otherwise there is no normal school; but there are teachers' institutes in each county. There is a State Board of Education, and in each county a school commission and a superintendent of public instruction.

Government.— The present constitution is of 1897; following the now usual Southern practice, it was not submitted to the people. The registration and educational provisions for the franchise enable the exclusion of all whom the governing classes think unfit. The legislature has a senate elected for four years and a house for two. The senate has seven members from Newcastle County (Wilmington, etc.), and five from each of the other two; the house has 15 members from Newcastle and 10 from each of the others. Sessions are biennial. Provisions for revenue and impeachment are the same as in the national Constitution. The members are paid $6 a day up to 60 days, after which they sit at their own expense; special sessions are thus limited to 30 days. The State officers are chosen for four years. The governor has a veto by items; his pardoning power is on recommendation of a board of pardons. The judiciary is composed of a supreme and superior court, a court of chancery, orphans' court, court of oyer and terminer, and registers' court; there are six judges,—a chancellor and five "law judges," of whom one is chief justice. They are appointed by the governor for 12 years, with the concurrence of the Senate.

The State has one representative in Congress, and therefore three members of the Electoral College, chosen by popular election.

There is a National Guard of 321 privates and 51 officers.

Finances.— Delaware's bonded debt in 1902 was $760,750, mostly incurred in 1887 and 1897. The assets were $1,118,509.16, over $1,000,000 invested. The State expenditures were $341,000. There are no State taxes on individuals; the receipts are from fees and licenses, inheritance tax, special tax on banks and railroads, etc. The assessed valuation of the State is about $70,000,000.

Divisions and Population.— The State has three counties: Newcastle, Kent, and Sussex. The former containing Wilmington, has three fifths the entire population of the State. The counties are divided into "hundreds" instead of townships, the towns being included in the hundreds. There are 35 incorporated cities and towns, of which Wilmington is the only large one; it had 70,508 in 1900, and has about 80,000 now. Of the others, the chief are New Castle, 3,380, a decrease from 4,010 in 1890; Dover, the capital, 3,329, slightly growing; Milford, 2,500; Lewes, 2,259; Smyrna, 2,168.

The population from the first census to the last is as follows: 1790, 59,094; 1800, 64,273; 1810, 72,674; 1820, 72,749; 1830, 76,748; 1840, 78,085; 1850, 91,532; 1860, 112,216; 1870, 125,015; 1880, 146,608; 1890, 168,493; 1900, 184,735. Of these, the males were 3,581 in excess. The colored were 30,758, or almost one sixth. The foreign-born numbered 13,810; the native-born of foreign parentage, 22,219. In Indian River hundred, Sussex County, there is a considerable body of "white Indians" or "Moors," traditionally descended from a band of shipwrecked Moorish sailors. They do not associate with the colored race, and maintain separate schools and churches with the help of the State.

History.— Delaware represents the sole attempt of Sweden to seize its share of America. It does not take its name from the Indians who inhabited it, but from the river and bay, named by the English after Lord de la Warr, who explored it in 1610; the Dutch called the river "South River," as distinguished from the "North River," the Hudson. The first settlement actually made in Delaware was by the Dutch trader, De Vries, in 1631, at Paradise Point, the present Lewes; he called it Hoornkill, from his Dutch home, but the English corrupted it to Whorekill, and invented a story to account for the name— as usual. The agent he left there fell out with the Indians, who slaughtered the whole settlement and burnt the manor house. In 1637 Axel Oxenstiern, the great Swedish minister of Gustavus Adolphus, revived his dead master's plan of founding a Swedish West India Company, and sent Peter Minuit, the ex-director-general of New Netherlands, with a mixed Swedish and Dutch expedition to seize and settle a point on the coast. Minuit landed April 1638, and fixed on the peninsula, where Wilmington now stands, about two miles back from the Delaware; he called the creek "the Elbe," and built a fort which he called Christina, after the girl-queen of Sweden, Gustavus' daughter. The creek later was given that name, now corrupted to Christiana, locally and more correctly Christeen. The entire domain he called New Sweden. The Dutch protested, but as their company had to pay its own war bills, they did no more; and in 1640 the Swedish government sent another body of colonists. More Dutch came also and settled some miles below; the stockholders of the enterprise were part in Holland and part in Sweden, and each party sent its own countrymen. The Swedish settlements were vigorous and spread rapidly, colonizing New Gottenburg at Tinicum Island and Upland near by, driving a New Haven English colony off Salem Creek in New Jersey and keeping the place themselves, with a fort called Elsenburg. In 1646 the Dutch built a block-house on the site of Philadelphia, opposite Fort Nassau built by them in 1623; the Swedish governor, Printz, marched there and pulled it down. But when Stuyvesant came to New Netherlands in 1647, he was under orders to fight; and in 1651 he built Fort Casimir on the site of New Castle, blocking the Delaware to the Swedes. Rising, Printz's successor, attacked and captured it in 1654, and changed its name to Trinity. Stuyvesant came down in 1655 with a large force, captured not only Trinity, but Christina, deported the officers to New Amsterdam, and forced the rest to swear allegiance to the Netherlands or leave the country. Trinity was renamed New Amstel. The Swedish dominion was ended; but its blood remained, and the tradition of alien independence in the mixed colonial strain made it utterly unassimilable, and has created the present State. The Dutch divided it into the historic three counties.

When the Duke of York took New Amsterdam from the Dutch in 1664, the Delaware settlements went with it, and New Amstel was renamed New Castle. When the Dutch retook New York in 1673, there was a renewed Dutch rule on the Delaware. In 1682 (24 August), William Penn, to give his new colony control of

the mouth of the Delaware, bought the lower settlements; it then contained about 6,000 Swedes, English, Dutch, and mixed breeds, who had always been governed by themselves or by a deputy from New York. He also bought a lingering boundary dispute with the Baltimores, not settled till 1768. The lower river settlements were at first governed as part of Pennsylvania, being called the "Three Lower Counties on the Delaware," and sending six representatives apiece to its legislature; but there was no community of interest and a violent discontinuity of feeling, and the lower counties insisted on a separate legislature. They obtained it in 1703, with a separate council in 1710, and kept it till the Revolution, the sessions being held at New Castle. The same governor was appointed for both, however. In the Continental Congresses the colony was separately represented, as "The Counties of New Castle, Kent, and Sussex, upon Delaware"; and on 21 Sept. 1776 it proclaimed a State constitution as "The Delaware State." For some years, however, it chose the same governor as Pennsylvania. It was the first (7 Dec. 1787) to ratify the national Constitution. In 1792 it adopted a new constitution and the name of "The State of Delaware"; in 1831 a third, and in 1897 the present one.

Delaware's naturally divided position as a slave-holding border State has been sharply accentuated by the natural antagonism between its agricultural and manufacturing sections. The northern part, an outcrop of the Pennsylvania manufacturing interests, has shared the Northern sympathies; the southern has always been Southern in feeling, and sent numbers of soldiers to the Confederate side in the Civil War. But the large preponderance of population in the north, though hampered by an unjust system of representation, made itself vigorously felt in the War; the legislature promptly voted "unqualified disapproval" of the proposal to secede; it answered the calls for Union troops so quickly and fully that Lincoln said in his message of 3 Dec. 1861, "Noble little Delaware led off right from the first"; and out of its 40,000 males from 14 to 60, it sent nearly 14,000 men to the Union armies, or over one third. When Reconstruction began, however, the legislative majority sympathized with their class, and denounced the Fourteenth Amendment, which the new constitution virtually abrogates. The leading element in the State politics since 1850 has been the "peace Democrats," devoted to the Union, but opposed to coercion of the States; as exemplified in the Bayard family (see BAYARD, JAMES A., 2D, and THOMAS F.). The Democratic majority, however, has been always small, except in 1878, when the Republican party was temporarily ruined by joining the Greenback-Labor movement. This balance has formed the basis of the effort for some years to win over Democrats enough to send John E. Addicks to the Senate (see ADDICKS, JOHN E., for a full description of the details), which has resulted in depriving Delaware of one senator for some years and of both latterly.

The people of Delaware are familiarly termed "The Blue Hen's Chickens," from their Revolutionary flag. As such, they were among the finest regulars in the Continental army.

Delaware, Ohio, city, county-seat of Delaware County; on the Whetstone (Olentangy) River, and on branches of the Cleveland, C. C. & St. L., the Pennsylvania, and several other railroads; 24 miles north of Columbus. It is the trade centre of Delaware and surrounding counties, and has manufactures of iron, flour, woolen, lumber, furniture, agricultural implements, etc. It is the seat of Ohio Wesleyan University, and the Ohio Wesleyan Female College. There are sulphur, magnesia, and other mineral springs nearby, and the city has large railroad repair shops, hotels, daily and weekly newspapers, and two national banks. Pop. (1900) 7,940.

Delaware Bay, a large bay or arm of the sea, between the States of Delaware and New Jersey. The Delaware River and several small streams flow into this bay. It is 65 miles long, and in the centre about 30 miles across, and about 15 at its mouth, from Cape Henlopen to Cape May. At the entrance to this bay, near Cape Henlopen, is situated the Delaware Breakwater, the object of which is to afford vessels a shelter within the cape. The breakwater proper is 1,200 yards in length, and runs in a straight line from east-southeast to west-northwest, leaving an entrance 650 yards wide between its east end and the north point of the cape. It serves also as an ice-break against the floating ice which sometimes comes down the bay. At the distance of 350 yards from the upper or western end of the breakwater a similar dike, of 500 yards in length, is projected so as to form an angle of 146° 15′ with the breakwater. Government lighthouses are stationed at the entrance, to indicate shoal places in the channel and breakers along the shore.

Delaware College, an institution founded at Newark, Del., 1833, closed in 1859. In 1870 it was reopened as a "Land Grant College"; the State of Delaware appropriating funds received under the Land Grant Act of 1862. Further aid received from the State funds obtained under the congressional act called the "Hatch Bill," enabled the college to open an experiment station in 1887. A still further grant was received under the act of 1890. The library contains (1903) about 14,000 volumes; the number of students enrolled in 1902, 75.

Delaware Indians (their own name Renno Renappi, or Lenno Lenape, "men": cf. Illinois, Innuit, Lokono, Muysca, Alemanni, etc.), an important Algonquin tribe which lay in the path of white settlement on both sides of the Delaware River, and therefore fills a large place in colonial history. Previously they had been subjugated by the Iroquois, who, instead of exterminating or absorbing them, exacted tribute, called them "women," and dictated their action. The early Dutch settlers were massacred as usual; but the Swedes on the Delaware upheld Indian titles to land to secure their own possession against the Dutch, compelling the latter in turn to buy instead of seizing, so there was peace with the Delawares in this period. The Swedes tried to Christianize them with Luther's catechism, without much success. In October 1682 Penn made his famous treaty with them, as well and as ill kept by his successors as others of the kind; that the Delawares did not revenge the white encroachments by massacre was due to Penn's sagacity in buying up their overlords, the Iroquois, who threatened to destroy them if they molested "Onas'" people. The infamous trick

of the "Walking Purchase" (q.v.) in 1737 (denounced by the Quakers) ousted them from half a million acres in the forks of the Delaware above Easton, and the Iroquois with furious menaces compelled them to retire to the Susquehanna. Here settlement pursued them, and not daring to resent it, a large part of them by 1750 had removed to the Alleghany and Muskingum, where they recovered Indian courage and ferocity. The Moravian missionaries converted part of the remainder, and these always remained peaceful. The others, maddened by aggression, joined the French and Iroquois in the French and Indian war, and helped in Braddock's defeat; sullenly yielding in 1758, after the Senecas had turned against them, they broke out again in Pontiac's Conspiracy (q.v.) of 1762, and were among the besiegers of Detroit, Fort Pitt, Duquesne, etc. Defeated by Bouquet at Bushy Run, 1763, they made peace in 1764–5. In 1768 all the remnants east of the Alleghanies migrated west; and the Christian Delawares founded the village of Gnadenhutten on the Muskingum. Roving bands of the others kept the field till the crushing defeat of Point Pleasant (q.v.), 1774. In the Revolution they were divided; part went with the English, part made a treaty with Congress in 1778. The Christians remained quietly at Gnadenhutten, till in 1781 the English broke it up and removed them to Sandusky. Part of them returned thither to save their crops, and were attacked by the Americans and 90 of them murdered; the rest fled mostly to Canada. Land was given them on the Thames, and they founded Fairfield, with others who came in 1787 from the Muskingum, where Congress had settled them. The wild tribesmen remained hostile, and contributed to St. Clair's defeat in 1791; but Wayne's victory forced them to make peace in 1795. Successive treaties removed them from Ohio, and by 1800 the main body were on White River, Indiana. They did not join Tecumseh in the War of 1812, and in 1818 they ceded all their lands each of the Mississippi and moved to White River, Missouri. There were then 1,800 in all, a few remaining in Ohio. Later, some went south to Red River, on the Texan border, by Spanish permission. By treaty of 24 Oct. 1829 the main body, about 1,000, settled on the Kansas and Missouri. They had schools and missions. In 1853 they sold all but a reservation in Kansas, invested the money sagaciously, and built fair houses, improved their farms, etc. During the Civil War, out of 201 warriors they sent 170 to the Union side, who proved good soldiers and guides. In 1866 their land was cut up by the Union Pacific Railroad, and they sold the whole in 1867–8, and took up lands on the Verdigris and Cane, bought from the Cherokees. A special treaty of 1866 permitted them to take lands in severalty and become citizens, they did so, and are not a "tribe" any longer, though they form a part of the "Cherokee Nation" in Indian Territory, numbering now 780. There are other bands, which in all make more than 780. They had three clans, the Turtle, Turkey, and Wolf or Munsee (q.v.); the latter, differing strongly from the rest, is in three divisions,— 120 on the Thames in Canada, about 200 at Green Bay, Wis., with the Stockbridges, and some 50 with the Chippewa in Kansas. There are also 95 on the late Wichita reserve in Oklahoma, 135 on Grand River reserve in Ontario, and 350 Moravians on the Thames.

Delaware & Hudson Railroad. The Delaware & Hudson Railroad system is the outcome of a series of amalgamations of many small lines leased and constructed from time to time by the Delaware & Hudson Canal Company, which was chartered under the laws of the State of New York in 1823 as a coal mining and transportation corporation. The State also loaned its credit of $500,000 to aid in the construction of a canal from Honesdale, Pa., across the Delaware River to the Hudson River, which was completed in 1828, hence the name "Delaware and Hudson." The canal was built to move boats carrying 25 tons. It was enlarged in 1844 for 40-ton boats and again in 1862 for boats of 125 to 150 tons capacity, and was finally abandoned in 1899.

The first steam locomotive ever placed on a railroad in the western hemisphere, "The Stourbridge Lion," made its trial trip on the Delaware & Hudson Railroad between Carbondale and Seeleyville, on 8 Aug. 1829. The locomotive was built by Foster Roswick & Company, of Stourbridge, England. It arrived in New York in May, 1829. It was of the grasshopper type with walking beams and vertical cylinders. The locomotive and the tender were each four-wheeled, with spokes and felloes of wood, iron tires and wheel centres. The track on which it ran was of strap iron spiked next the inner edge to large hemlock sleepers laid on cross ties.

The product of the Delaware & Hudson anthracite mines was 7,000 tons in 1829, 5,332,608 tons in 1904. In 1905 the Company operated 843 miles of railroad, employed about 18,000 men in its coal department, 9,000 in the railroad department, and 1,000 in its iron-mining department. The rail lines extend from Binghamton, N. Y., and Wilkes-Barre, Pa., to Rouses Point, N. Y., on the Canadian border, to Lake Placid, N. Y., and to Rutland, Vt., with many branch lines. The steamboat lines on Lake Champlain and Lake George, the Albany and Troy Traction lines, and the extensive iron mines and furnaces at and near Lyon Mountain, in the Adirondacks, are subsidiary Delaware & Hudson interests. The Company has also acquired the Quebec Southern Railway and will soon have an unbroken line from Wilkes-Barre, Pa., to the City of Quebec.

In the number and variety of its summer resorts, the Company holds a unique position. Among the important resorts on its lines are Cooperstown, Sharon Springs, Round Lake, Saratoga Springs, Lake George, Au Sable Chasm, Lake Champlain, and the mountain attractions of the Adirondacks.

Its earnings from passenger traffic are about $3,000,000 per annum, from freight about $12,000,000, and from coal about $20,000,000. The authorized capitalization of the Company is $55,000,000. Dividend payments are seven per cent.

The Company's position in the railroad family has been exempt from community of interest, domination, or influence by any of its railway neighbors or competitors through stock ownership, its untrammeled position in this respect leaving it free to develop its resources without interference.

J. W. Burdick,
Passenger and Traffic Manager.

Delaware, Lackawanna & Western Railroad Company, The, is a consolidation of a number of short railroads originally separate corporations, most of which were acquired by lease or purchase at different times and under various conditions.

The present D., L. & W. R. R. system comprises 2,304½ miles of line. It extends from the seaboard at New York to the Great Lakes at Buffalo, through New Jersey, Pennsylvania, Southern and Western New York, with branches into the slate and cement regions of Pennsylvania and New Jersey, and anthracite coal fields of Pennsylvania, and the agricultural, dairy and industrial area of Central New York. It carries on its rolls 19,977 employees, exclusive of those employed in the Company's coal department. The oldest portion of the present system was originally named the Ithaca & Owego Railroad, now known as the Ithaca Branch. The charter of this road was dated 28 Jan. 1828; the capital stock was $150,000. In 1832 the north end of the road was completed and the capital stock increased to $300,000. The length of road was 29 miles. Stationary engine and horse power was first used, the Company having no locomotives. The track was standard gauge, having a strap rail 2¼ inches by ⅝ of an inch. The first 13 miles of the road were open 13 Feb. 1834, and on 1 April 1834, the road was completed. The first locomotive was placed in operation on this road in the spring of 1840.

Financial revolutions of that period resulted in the foreclosure of a mortgage of $300,000 held by the state of New York for moneys advanced the Company, and the road was sold at public sale in Albany 20 May 1842 for $18,000. It was reorganized 13 April 1843 as the Cayuga & Susquehanna Railroad Company. On 21 April 1855, it was leased in perpetuity to the D., L. & W. R. R. Co.

The Morris & Essex Railroad, also part of the present D., L. & W. R. R. system, was projected in the early part of 1835, the purpose being to construct a railroad from Morristown, N. J., to some point in Essex County, contiguous to the tide water near New York harbor. The railroad was chartered 29 Jan. 1835, and the Company commenced running their cars by horse power from Newark to Orange 19 Nov. 1836; from Newark to Madison by steam power on Monday, 2 Oct. 1837, and from Newark to Morristown on 1 Jan. 1838. The average daily receipts from Newark to Morristown for passengers from 1 Jan. to 1 May, 1838, was $72. The road was completed to Dover 1 Aug. 1848; to Hackettstown, N. J., 16 Jan. 1854, and Phillipsburg, N. J., in 1867.

The Newark and Bloomfield Railroad running from Newark, N. J., to Bloomfield, N. J., now known as the Montclair branch of the D., L. & W. R. R. Co., was opened 1 July 1856, having been chartered 6 March 1852. This road was leased to the Morris & Essex Railroad.

The New Jersey Legislature seems to have passed an act in 1857 granting a permit to the M. & E. R. R. to build a line from Hoboken to Newark and to make such arrangements with the Hoboken Land and Improvement Company and the New Jersey Railroad Transportation Company as might be approved for running trains between Newark and Hoboken. Local trains were run between East Newark Junction and Hoboken Ferry until 1863, when the M. & E. R. R. trains commenced running to Hoboken over the Passaic River Bridge, purchased from the New Jersey Railroad & Transportation Company, thus reaching tide water at its own terminal. In order to avoid the steep grades of the original line, the M. & E. R. R. Co. obtained on 23 March 1865, permission to build from a point at or near Denville, N. J., connecting with its main line thence by way of Boonton, N. J., connecting with the Newark & Bloomfield Railroad. The M. & E. R. R. was leased to the D., L. & W. R. R. Co. on 10 Dec. 1868, the lease being ratified by the Legislature on or about 9 Feb. 1869, the road then becoming the Morris & Essex division.

The Sussex Railroad of New Jersey, another of the subsidiary companies of the present D., L. & W. R. R., was chartered 5 Feb. 1853, and was open for business 11 Dec. 1854. It joined the M. & E. Railroad at Waterloo, N. J., soon after the extension to Hackettstown, N. J., was built. Since August, 1881, the Sussex Railroad of New Jersey has been operated by the D., L. & W. Railroad, the junction now being made at Netcong, N. J.

The Chester Railroad, which joins the Morris & Essex division near Port Oram, N. J., was chartered in 1868 and opened in 1872. The Passaic & Delaware Railroad, now running from Summit, N. J., to Gladstone, N. J., was organized 9 Oct. 1878, and was leased 1 Nov. 1882, by the D., L. & W. R. R., the road then running from Summit to Bernardsville, N. J., In 1890 the road was extended to Gladstone, N. J.

The original main line of the present D., L. & W. system was first known as the Leggett's Gap Railroad, taking its name from a gap about two miles below Scranton. Its route lay from Scranton, Pa., to the Susquehanna River at Great Bend (near Binghamton, N. Y.), 53½ miles, there connecting with the then New York & Erie Railroad. The charter was obtained 14 March 1849. A supplement to this charter was approved 14 April 1851, by which the corporate name of the railroad became the Lackawanna & Western Railroad Company. The road was opened and the first train run about 15 Oct. 1851. The road was open for regular traffic on Monday, 20 Oct. 1851. By a purchase of the charter of the Delaware & Cobb's Gap Company, which latter was incorporated 7 April, 1849, but which never began the work of construction, the Lackawanna & Western Railroad Company became the Delaware, Lackawanna & Western Railroad Company, and the act of the Legislature for this consolidation was approved 11 March 1853.

The company owned valuable anthracite coal lands in Pennsylvania, but the use of this coal was not well understood by the public and the company concentrated its energies to develop this important part of its trade. Public interest in anthracite coal fuel was aroused by advertising and by distributing free samples. Carloads of coal were given away in order to induce parties to give it a trial. In order to get its coal to tide water the company finally decided to connect with the Warren Railroad of New Jersey. The latter was chartered 12 Feb.

1871 for a line 188 miles from the Delaware River at Springville, Pa., to Hampton Junction, N. J., where connection was made with the Central Railroad of New Jersey to New York. The Warren Railroad was known as the Southern Division of the Lackawanna. It was opened for traffic on 27 May, 1856. When the D., L. & W. R. R. became amalgamated with the Morris & Essex Railroad, Washington, N. J., was made the transfer point to the Morris & Essex division and trains proceeded via that route to Hoboken. The D., L. & W. R. R. used the Bergen tunnel of the Erie Railroad until 1876, at which time the D., L. & W. completed its own tunnel through the Bergen Hill.

The Oswego & Syracuse Railroad was chartered 29 April 1830. The road was opened 14 May 1838. Traffic was commenced the end of October of that year. This railroad was leased to the D., L. & W. R. R. Co. 13 Feb. 1869.

The Syracuse & Binghamton Railroad was chartered 13 Aug. 1851, and was opened 18 Oct. 1854. It was reorganized with the title of the Syracuse, Binghamton & New York Railroad, 30 April 1857. A contract was then made with the D., L. & W. R. R., under which the road was operated, and in 1869 the D., L. & W. R. R. obtained control of the line by purchasing the major portion of its stock, thus completing the branch from Binghamton, N. Y., to Oswego, N. Y.

The Utica, Chenango & Susquehanna Railroad was organized 11 Jan. 1866, and was opened 10 Oct. 1872, before which date the Greene Railroad, a short connecting line, organized 18 Oct. 1869, was opened in 1871. These two railroads, together with the Richfield Springs branch, now form the Utica Division of the D., L. & W. R. R., having been leased on 9 April and 26 April 1870.

The Valley Railroad, beginning near Great Bend, Pa., and thence to Binghamton, N. Y., was organized 4 March 1869, and opened in 1870. It was leased 15 April 1869, to the D., L. & W. R. R. and added a short link between Great Bend and Binghamton.

The New York, Lackawanna & Western Railroad Company was chartered 26 Aug. 1880, to build a road from Binghamton to Buffalo, and on 17 Sept. 1882, the road was opened for traffic. On 2 Oct. 1882, it was leased in perpetuity to the D., L. & W. R. R. Co. The main line was thus completed from Hoboken to Buffalo.

The D., L. & W. R. R. assumed control of the Bangor & Portland Railroad 1 Aug. 1900, by purchase of its capital stock. It likewise assumed control of the Erie & Central New York Railroad, running from Cortland to Cincinnatus, N. Y., 1 Dec. 1903, by purchase of its capital stock and bonds, and of the Hoboken Ferry Company, operating a fleet of passenger ferry boats between Hoboken and New York, 1 May 1903, by purchase of its capital stock.

The last annual report of the company shows that during the year ending 31 Dec. 1904, the total number of passengers carried were 17,946,686, while the miles run by passenger trains were 5,411,862. In merchandise the number of tons transported were 7,206,679, while the amount of coal transported represented a total of 8,615,768 tons. During the year 6,510,621 miles were run by freight trains and the average earnings per train mile were $3.31. The gross earnings were $25,833,491.72, while the net income of the company was $6,773,870.72.

Delaware River, in the eastern part of the United States, has its rise in the Catskill Mountains in New York. It forms the boundary line for a short distance between New York and Pennsylvania, is on the whole length of the boundary line between Pennsylvania and New Jersey, and flows into Delaware Bay about five miles below Newcastle. Its most important tributaries are the Schuylkill and the Lehigh. The whole length from its source to the bay is about 300 miles. The principal towns on the Delaware, besides Philadelphia, are Burlington, Trenton, and Easton.

Delaware Water Gap, Pa., village in Monroe County, on the Delaware River and the Delaware, Lackawanna & Western, the New York, Susquehanna & Western railroads; near Stroudsburg, Pa., 65 miles northwest of New York. The Delaware River, where it passes through the Kittatinny Range of the Appalachian Mountains, forms a gorge about three miles in length, and above the water the sides rise to the height of 1,400 feet.

Delawarr, or Delaware, Thomas West. See WEST, THOMAS, LORD DELAWARR, or DELAWARE.

Del'brück, Martin Friedrich Rudolf von, German statesman; b. Berlin 16 April 1817; d. there 1903. Entering public life in 1849 he was made director of the division of commerce and industry, and his part in detaching Prussia from the Austrian commercial policy was considerable. After 1862 Bismarck, then president of the cabinet, supported von Delbrück's commercial ideas, and upon the same principles he negotiated treaties with foreign powers. In 1867 Delbrück was made president of the imperial chancellory. Later he negotiated the treaties which made Germany a unit. For five years after the founding of the empire Delbrück retained his office as president of the general chancellory, now become the imperial chancellory. In 1876 he was dismissed in spite of his reputation and service. Later, as a member of the Reichstag, he dared oppose Bismarck. He retired from the Reichstag in 1881. He published 'Der Zollverein und das Tabaksmonopol' (1857); 'Der Artikel 46 der Reichsverfassung'

Delcassé, Théophile, tā-ō-fēl dĕl-kā-sā, French editor and statesman; b. Pamiers, France, 1 March 1852. For some time on the staff of 'La République Française' and was elected deputy from Foix 1889 and re-elected 1893 and 1898. He was under secretary of state for the colonies and became minister for the colonies in 1894. He was minister of foreign affairs in Brisson's cabinet, holding the same office under Depuy, Waldeck-Rousseau, and Combes. He settled the "Fashoda Affair" with England and gave an eastern frontier to the possessions of France in Africa. He also concluded a commercial convention with the United States. Owing to disapproval of his Moroccan policy, on 6 June 1905 he resigned his post as minister of foreign affairs.

Deleb' Palm, the *Borassus Æthiopum*, a native of the interior and west of Africa, allied

to and somewhat resembling the Palmyra palm (q.v.). Its leaves and fruits are used by the Africans for the same purposes as those of the Palmyra by the Asiatics, and the tender roots produced by the young plant are extensively used as an article of food. The trunk is swollen about halfway up.

Delécluze, Etienne Jean, ā-tē-ĕn zhŏń dė-lā-klüz, French painter and critic: b. Paris 20 Feb. 1781; d. Versailles 12 July 1863. He was a pupil of David, and although achieving a fair success in painting he abandoned it for criticism 1816. He was connected with several reviews and papers, including the *Moniteur* and the *Journal des Débats,* and the *Revue des Deux Mondes,* being allied with the young literary circle of the Restoration. He also wrote several novels. Among his many works are: 'History of Painting' (1828); 'Mademoiselle Justine de Liron' (1832); 'Life and Works of Leopold Robert' (1838); 'Dona Olympia, the Sister-in-law of Pope Innocent X.' (1842); 'Gregory VII., St. Francis d'Assisi and St. Thomas Aquinas' (1844); 'Louis David. His School and His Times' (1855); and 'Souvenirs of Sixty Years' (1862). In the museum at Versailles there are some curious pen and ink sketches by him of scenes of the invasion of Paris in 1814. Among his paintings are: 'Death of Astyanax'; 'Carrying off Europa'; 'Paris Carrying off Helen'; 'Sacrifice to Ceres', and 'Augustus and Cinna.'

Delegate, a person appointed and sent by another or by others, with powers to transact business as his or their representative. The title was given to members of the first Continental Congress in America 1774. Representatives to Congress from the United States Territories are still designated by this term. They have the right of discussion, but have no vote. A delegate in old English law was one of a body of commissioners, so called because delegated or appointed by the king's commissioners under the great seal, to sit upon an appeal to the king in the court of chancery.

Delegates, Court of, the old English court of appeal, and was so called because the judges thereof were delegated, by the king's commission under the great seal, to hear and determine appeals in the three following cases: (1) Where a sentence was given in any ecclesiastical cause, by the archbishop or his official; (2) when any sentence was given in any ecclesiastical cause in the places exempt; (3) when a sentence was given in the admirals' court, in suits civil and marine, by order of the civil law. This court has been abolished, and the privy council is now the great court of appeal in all ecclesiastical causes.

Delegation, the investing with authority to act for another. Hence the name has been given to a body of persons thus deputed. Before the present Constitution of the United States of America was adopted, the persons constituting the Congress at Philadelphia were called delegates, and the body of representatives of a State in Congress are still called the delegation of a State. In Maryland and Virginia the branch of the State legislatures which, in most of the other States, is called house of representatives, has the name of house of delegates. The name of delegate is also given to the representatives sent to the Congress of the United States from Territories not yet formed into States. In Italy branches of government are often called *delegazione,* and their members *delegati.* Formerly in Lombardy, Venice and the states of the Church the term *delegazione* was applied both to the governor and governing court of a province and to the province itself. The delegate was always a prelate, and directly appointed by the Pope.

In the civil law delegation is that act by which a debtor transfers to another person the duty to pay, or a creditor transfers to another person the right to receive payment.

Delenda, dē-lĕn'da, things to be erased or expunged. *Delenda est Carthago* is the celebrated sentence with which Cato the elder was accustomed to conclude all his speeches in the Roman senate. His hatred of Carthage arose from a jealousy of its flourishing state, and the consequent danger to Rome.

De Leon, Edwin, American prose writer: b. Columbia, S. C., 1828; d. New York 1 Dec. 1891. From 1854 to 1862 he was engaged in editorial work; from 1862 to 1870 held the office of United States consul-general and diplomatic agent at Cairo, Egypt. His published works include: 'Thirty Years of My Life on Three Continents'; 'The Khedive's Egypt,' a novel; 'Askaros Kassis, the Capt'; and 'Under the Star and Under the Crescent.'

De Leon, Thomas Cooper, American author and playwright: b. Columbia, S. C., 21 May 1839. He was auditor Topographical Engineering Bureau, Washington, 1858–61, served in Confederate army 1861–5, and at the close of the war was connected with magazine and newspaper work in Baltimore, New York and Mobile. He organized the Mobile Mardi Gras Carnival and was its manager for 25 years, and has designed carnivals for many other cities for their various celebrations. Among his works are: 'The Rock or the Rye'; 'Creole and Puritan'; 'A Fair Blockade Breaker'; 'The Puritan's Daughter'; 'Four Years in Rebel Capitals'; 'Out of the Sulphur'; 'A Bachelor's Box'; 'An Innocent Cheat'; 'Crag Nest'; 'Life of Joseph Wheeler'; and 'Confederate Memories.'

Delescluze, Louis Charles, loo-ē shärl dė-lā-klüz, French communist: b. Dreux 20 Oct. 1809; d. Paris 28 May 1871. The February revolution opened to him a career in Paris, where his clever and facile pen quickly made him popular with the rabble, but earned him from the authorities imprisonment and a fine of 10,000 francs. Again at Paris in 1853, he was sentenced to two years' imprisonment, and was next transported to Cayenne, where he remained till 1859. His experiences of his sufferings he gave in 'De Paris à Cayenne: Journal d'un Transporté' (1867). After his return he was quiet for some years, until his journal, 'Réveil,' started in 1868 to advocate the doctrines of the International, brought him anew into trouble. In the history of the Paris Commune he played a prominent part, and upon his head rests in great part the guilt of the murder of the hostages, and the burning of the public buildings of the city. He died on the last barricade.

Delessert, Benjamin, bŏń-zhä-măń dė-lĕs-sār, French naturalist and philanthropist: b. Lyons 14 Feb. 1773; d. Paris 1 March 1847. In 1803 he started cotton-spinning in France, but is particularly distinguished by his efforts to pro-

duce beet-root sugar. As early as 1801 he was engaged in refining, but in 1806 he began the experiments which were successfully terminated and announced to Chaptal on 2 Jan. 1812. When he heard of it Napoleon was in ecstasies: "We must see it: let us go," he said. "Delessert," says Flourens, who narrates this incident, "had just time to go to Passy, where his work was. On his arrival he found the gates surrounded by the imperial chasseurs, who refused him admittance. He told them who he was and entered. The emperor had seen and admired everything; excitement was at its height. Approaching Delessert, the emperor took the cross of the Legion of Honor from his own breast and gave it to him. It was announced next day in the *Moniteur* "that a revolution in French commerce had been accomplished.' " Delessert lived through the collapse which the manufacture suffered after Napoleon's fall, and long enough to see it revive and become of the greatest importance.

Delft, or **Delf**, Holland, town in the province South Holland, eight miles northwest of Rotterdam. It stands on a dead flat, and is intersected in all directions by canals, which are crossed by 60 bridges, mostly of stone. These canals make the great market-place with its public buildings an island, approached by nine bridges. The counterscarps of the old ramparts are now planted with trees, and form public walks. The town-hall (*Stadhuis*), in the market-place, is a large, solid-looking building, with a heavy square tower rising from its roof. The Prinsen-hof, once the occasional residence of William I. of Orange, and the scene of his assassination, is now a military barrack. The old Reformed church contains the monuments of Admirals Tromp and Hein, the famous naturalist Leeuwenhoek, and other worthies. The magnificent mausoleum of William, and the burial-place of the Orange family, are in the new church (1412–76); and from its huge square tower the town and neighborhood are from time to time regaled with the richest music from a chime of three octaves; the new church contains also the tomb of Hugo Grotius. Delft has long been the seat of an arsenal, and was formerly the centre of the manufacture of the kind of pottery called delftware or delf. The chief manufactures now carried on comprise firearms, carpets, leather, soap, oil, and gin. In 1654 the powder magazine of the arsenal exploded accidentally, when not a single house entirely escaped, and many persons were killed or maimed. Pop. 32,021.

Delftshaven, dĕlfts-hä'vĕn, or **Delfshaven**, formerly a small independent town in Holland, but included in Rotterdam (q.v.) since 1886. The place is noted as having been the point of embarkation of the Pilgrim Fathers when, in 1620, they sailed for America.

Delftware, or **Delf-ware**, a kind of pottery originally manufactured at Delft, in Holland, in the 14th century. It was among the best of its day, many examples being considered equal to the Italian in quality, but somewhat inferior in its ornamentation. It is covered with an enamel or white glazing which gives it the appearance of porcelain. The glaze of the delftware is made as follows: Kelp and Woolwich sand are calcined together, to form a vitreous mass called frit. Lead and tin are calcined to form a gray, powdery oxide. The frit is powdered and mixed with the oxide, zaffre being added to confer blue color, arsenic for dead-white. This is fused, making an opaque enamel; ground and mixed to the consistency of cream. Delftware is made of a calcareous clay of varying color, strained, and evaporated to a plastic consistency; it is then tempered, and stored in cellars to ripen. Prolonged storage increases its tenacity and plasticity. It is then kneaded without sand; formed on the wheel, dried, and partially burned, reaching the biscuit condition. The bibulous ware is then glazed, dried, packed in saggars, which are piled in the kiln and baked.

Del'hi, India, city in the Punjab, capital of a division of the same name, and anciently of the Patan and Mogul empires; about 700 miles northeast of Bombay, and about 790 miles northwest of Calcutta. It was at one time the largest city in Hindustan, covering a space of 20 square miles, and having a population of 2,000,000. It is now reduced to a circumference of seven miles. A vast tract covered with ruins marks the extent of the ancient metropolis of the Mogul empire. The present city, built on two rocky eminences, is surrounded by walls of red sandstone 30 feet high, and from three to five feet thick, with a moat 20 feet broad. There are seven colossal arched gates, defended by round bulwarks, and all built of freestone. The streets of the old part of the city are narrow, but in the modern portion they are broad. The houses here are of sandstone and brick, and are of two and three stories in height. The palace or residence of the Great Mogul, built by Shah Jehan, commenced in 1631, and finished in 10 years, is by far the most interesting building in Delhi, and the most magnificent structure of the kind in India. The Great Mosque, a magnificent structure in the Byzantine-Arabic style, is considered by the Mohammedans the wonder of the world. It is built of white marble and red sandstone, inlaid like mosaic, in lines and arabesques; at the two extreme corners rise minarets 150 feet high, and between them two lofty domes. This imposing edifice was built by the Emperor Shah Jehan, in the 17th century, and took several thousand men for six successive years (1631 to 1637) to complete it. There are no fewer than 40 other mosques in different parts of the city, many of them having lofty minarets and gilded domes. The fine structure which stands near the Ajmeer gate was formerly the Delhi College. The famous observatory of Jye Singh, rajah of Jyepoor, at the southwest extremity of the city, has been much dilapidated, and its astronomical instruments nearly all destroyed or carried off. A monument was erected in 1888 by the government to Willoughby, one of the heroes of the siege in 1857. The principal manufactures of the town are cotton cloths, indigo, finely embroidered shawls and jewelry, for which, as well as for delicately carved ivory, Delhi is somewhat noted. The chief imports are by the northern caravans, which bring from Cashmere and Cabul shawls, fruit, and horses. Precious stones of good quality are to be had at Delhi, particularly the large red and black carnelians. The agricultural products of the district consist chiefly of wheat, rice, millet, and indigo. The trade of the neighborhood is centred in Delhi, and the Rajputana State Railroad traverses the district.

Delhi, or as anciently called, Indraprastha, is one of the oldest cities of India. The modern name Dilli or Delhi is first met with in the 1st century B.C. It has been taken frequently by hostile powers. In the beginning of the 19th century the prosperity of the city and country around was threatened with destruction, and the Mogul emperor and royal family were reduced to poverty and distress, by the Mahrattas, who took possession of his capital, of his gardens and houses, and used his name to oppress and impoverish the people by fraud and extortion. From this miserable state of desolation and ruin the city was rescued by the British in 1803, when it was entered and taken possession of by Lord Lake. On the breaking out of the Indian mutiny in May 1857, Delhi became the centre of the operations of the rebels, who flocked to it from all quarters. The nominal representative of the Great Mogul, who held the sovereignty of the place under British protection, joined cause with the rebels; and in addition to assuming the character of an independent potentate, gave his sanction to the massacres and atrocities perpetrated on the European residents. By the middle of June a British army assembled in front of the city, and a siege commenced, which, from the smallness of the besieging force, was necessarily slow and protracted. It was brought to a successful termination on 20 September, when Delhi was entered by the British troops, and the nominal sovereignty heretofore possessed by the king was declared ended; and he himself, after being tried for the murders committed under his authority, was found guilty, and sentenced as a convict to perpetual banishment. A large part of the place was reduced to ruins in the mutiny and siege, but it has since recovered much of its former appearance, and has also been much improved in its sanitary condition. Pop. 208,385.

Delhi, N. Y., village and county-seat of Delaware County; on the Delaware River, and a branch of the New York, Ontario & Western Railroad, about 55 miles east of Binghamton. It is in one of the best dairying regions in the country, and the trade is largely in butter, cheese, eggs, and agricultural products. Pop. 2,100.

Delibes, Clément Philibert Léon, klā-môn fē-lē-bār lā-ôn dė-lēb, French composer: b. St. Germain du Val 21 Feb. 1836; d. 18 Jan. 1891. He entered the Paris Conservatoire in 1848, and in 1855 produced an operetta, 'Two Bags of Charcoal.' At the Grand Opera, where he became second director in 1865, his music for the ballet 'The Fountain' (1866), met with great success, and his ballet-music for 'Coppélia' (1870), his finest work, secured his position as a composer. He wrote music for a third ballet and for three comic operas, one of which, 'The King Said So' (1873), became very popular. In 1880 he was appointed professor in the Conservatoire.

Delilah, dē-lī'lä, the Philistine mistress of Samson. She persuaded him to reveal to her the secret of his great strength, and learning that it lay in his long and thick hair, cut off his locks while he was asleep and then treacherously delivered the helpless man into the hands of his enemies.

Delille, Jacques, zhäk dė lēl, French didactic poet: b. Aiqueperse, Auvergne, 22 June 1738; d. Paris 1 May 1813. His translation of Virgil's 'Georgics,' published in 1770, with a 'Discours Préliminaire' and numerous annotations, established his fame and obtained him admission to the French Academy. He became professor of Latin poetry in the College of France, and of belles-lettres at the University of Paris. Though an adherent of the old system, Robespierre spared him on every occasion. At his request Delille wrote the 'Dithyrambe sur l'Immortalité de l'Ame,' to be sung on the occasion of the public acknowledgment of the Deity. His reputation mainly rests on the 'Georgics' and 'Les Jardins,' a didactic poem. Other works are 'L'Homme des Champs'; 'La Pitié'; 'Les Trois Règnes de la Nature'; 'La Conversation'; 'L'Enéide de Virgile.'

Deliques'cence (Lat. "to melt away"), in chemistry the property manifested by many salts, of absorbing moisture from the atmosphere until they become distinctly damp. The name is usually applied to the more pronounced cases, in which the moisture absorbed is so copious that the salt becomes visibly wet, or even dissolves entirely; salts in which the action is less pronounced being called "hygroscopic." Carbonate of potash, caustic potash, and chlorid of calcium are familiar examples of deliquescent substances.

Delirifa'cient, any drug that induces an irritability of the brain leading to forms of delirium. Thus alcohol for some susceptible minds invariably leads to delirium in the early stages, and also induces delirium in chronic poisoning. Belladonna is a drug that causes a certain amount of delirium, as do also cannabis indica, cocaine and its allies. Opium in small doses brings about an exhilaration and for some delirium. Mescal, a drug widely used among the Indians of South America and of the southwestern United States, also induces a form of delirium. Delirifacients are rarely used in medicine for the effect on delirium.

Delirium is a temporary general disturbance of consciousness, a perversion of the intellectual and perceptive faculties, characterized by a greater or less degree of mental irritation or confusion, by more or less transitory delusions and fleeting hallucinations, accompanied by disordered, senseless speech and muttering, and motor unrest. It varies in degree from the ordinary wandering or flightiness of the lower form, to the higher, excited or more violent form, closely approaching mania.

Delirium is one of those conditions or symptoms to which the word "functional" is applicable, since it is not a disease *sui generis*. The word itself is a curious derivative from "de," from, and "lira," a ridge between two furrows. The Latin word *delirare*, signifying to deviate or wander from a straight line, figuratively — to be crazy, deranged, out of one's wits, to be foolish, to rave. Hence the term "wandering" so often associated with, and used to express, the presence of delirium. This wandering need not necessarily imply that of speech alone, for a deaf-mute or an aphasiac may become as delirious as any other person. Delirium is unquestionably experienced by dumb animals.

Continuous or chronic delirium necessarily merges into insanity; though the term delirium should not be used synonymously with insanity, even admitting that the former implies, or pre-

supposes, an unsound mind at the time of its inception.

False beliefs, false or perverted sense perceptions, also constitute a part of the mental condition known as delirium.

Two distinct varieties of delirium are recognized (although transient forms exist), namely, the primary active or wild form, *delirium acutum, delirium grave*,—and the secondary or lower form. The former is not an individual affection, but a condition of varying mental disturbance which occasionally attends different states of bodily disorder such as collapse, intoxication, katatonia, etc., and often, if not altogether, dependent upon, at least associated with, demonstrable lesions of the gray matter of the brain. It is characterized by increased restlessness, in which the patient tries to escape from bed, shouts, struggles with imaginary enemies and requires physical or even mechanical restraint. This form is generally associated with alcoholics (delirium tremens).

The secondary or lower form is by far the most common, and less understood, the patient lying with comparative quietness but incessantly engaged in incoherent and disjointed converse with imaginary personages, or communing with his own disordered brain. It generally appears in the exanthematous diseases of children, measles, scarlet fever, etc., also in the second and third weeks of typhoid fever.

The outset of delirium may be sudden or slow. If coming slowly, the first indication of its presence may be a certain confusion and difficulty in recognizing surroundings, after awakening from sleep; the mental confusion lasting a longer period on each occasion and finally developing into a well-marked delirium. A practical point to bear in mind is that a quiet delirium may shift very suddenly into an active one.

There are innumerable causes of delirium, the more prominent ones being infectious fevers, in the young and able-bodied, diseases dependent upon some specific micro-organism, such as is seen in typhoid fever, pneumonia, scarlet fever, yellow fever, puerperal fever, pyemia, and malaria; although delirium occurs also in analogous diseases not proven directly due to any specific micro-organism, also in trauma. Surgical operations are frequently followed by delirium.

In the delirium of intoxication the causes may be divided into endogenous and exogenous, the former arising from within the body proper, such as septic intoxication, pyemic or uremic absorption, cholemia, diabetes, auto-intoxication and insolation, that is, sunstroke. The latter (exogenous) causes are alcohol, drugs, mydriatics, for example, belladonna, duboisin, atropin. Also cocaine, morphine, mineral poisons, for example, iodoform.

Delirium due to exhaustion and inanition is seen in acute anæmia, resulting from hemorrhage of any cause, or the presence in the blood of powerful hæmic poisons, for example, plasmodium of malaria. It is also due to wasting diseases and lactation.

Delirium may originate in central or peripheral lesions of the brain, for example, blood clot from accidental injury, trauma, surgical operations, meningitis or encephalitis. Delirium may also be due to, or associated with, central depression, notably that occasioned by epilepsy, hysteria major, etc.

Delirium of senility is due to inanition and pathologic changes in the cerebral vascular supply.

The delirium of disease, or acute delirium, resembles that arising during febrile diseases; it is ordinarily accompanied by rise of temperature, which pursues no definite course, and by rapid and progressive body weakness (asthenia), and the typhoid state. The treatment consists of utilizing remedial agents that rapidly produce sleep, and fighting the progressive weakness, by stimulating drugs and nutrition, quieting the motor unrest and reducing fever by hydrotherapy, etc.

Mild forms of delirium, such as occur in children suffering from measles, auto-infection from the gastro-intestinal tract, etc., require no treatment *per se*, the treatment being directed against the exciting cause. In typhoid fever and pneumonia delirium is best controlled by the ice pack or sponging with cold water and cold bath. The early inception of delirium in these fevers is a grave and dangerous symptom.

The treatment of delirium in general is first: Induce sleep, and quiet motor unrest; this is best accomplished by the reduction of fever, the exhibition of proper narcotics, thorough cleansing of the intestinal tract, and hydrotherapy. In the selection of hypnotics, the one or the group which is followed by the least depression is advisable. Hyoscamine, in sthenic cases is safe and reliable. Bromide of potassium, chloral hydrate, hyoscin, morphine and opium and the various synthetic coal tar derivatives are frequently used. Second: Discover, if possible, and remove the inciting cause of delirium; to do this the pathological factor must be determined and treated accordingly.

Delirium Tremens. See DELIRIUM.

De Lisle, Charles. See LECONTE DE LISLE, C.M.R.

Delisle, Guillaume, gē-yōm dė-lēl, French geographer: b. Paris 28 Feb. 1675; d. there 25 Jan. 1726. He was instructed by Cassini, and soon conceived the idea of reforming the whole system of geography. He published, in his 25th year, a map of the world, maps of Europe, Asia, and Africa, and a celestial and a terrestrial globe of a foot in diameter. By rejecting Ptolemy's statements of longitude, or rather by comparing them with the astronomical observations and the statements of modern travelers, he founded the modern system of geography.

Delisle, Joseph Nicolas, zhō-zėf nīk-ō-lā, French astronomer: b. Paris 4 April 1688; d. there 11 Sept. 1768. He was a brother of Guillaume Delisle (q.v.). Among his works are: 'Mémoires pour servir à l'histoire et au progrès de l'astronomie' (1738); 'Mémoire sur les nouvelles découvertes au nord de la Mer du Sud' (1752).

Delitzsch, Franz, German Hebraist and theologian: b. Leipsic 23 Feb. 1813; d. there 4 March 1890. He was educated in the university of his native city, became professor of theology at Rostock in 1846, at Erlangen in 1850, and in 1867 at Leipsic. His earlier works dealt with post-biblical Jewish literature, and he afterward wrote commentaries on various books of the Old Testament. He was also the author of numerous theological and devotional works, among which were 'Biblico-prophetic Theology' (1845); 'The House of God' (1848); 'Biblical

Psychology' (1855); 'Jesus and Hillel' (1867); 'Christian Apologetics' (1869). He was chiefly eminent as a commentator on the Old Testament, and his honesty as a theologian was shown in the concessions he was willing to make (in the last edition of his commentaries on Genesis and Isaiah, 1887) to the latest critical views of the Pentateuch.

Delitzsch, Friedrich, frēd'rĭH dā'lĭch, German Assyriologist: b. Erlangen, Bavaria, 5 Sept. 1850. He is a son of Franz Delitzsch (q.v.). He has published among other works: 'Assyrian Studies' (1874); 'Where is Paradise?' (1881); 'Prolegomena of a New Hebrew and Aramaic Vocabulary to the Old Testament' (1886); 'Assyrian Vocabulary' (1887 onward); 'Assyrian Grammar' (1889); 'Assyrisches Handwörterbuch' (1894–6); 'Das Babylonische Weltschöpfungsepos' (1896); and a translation of George Smith's 'Chaldean Account of Genesis.' In 1877 he became extraordinary professor in Leipsic, ordinary professor at Breslau in 1893, and in 1899 professor of Assyriology in the University of Berlin.

Delitzsch, Germany, a town of Prussian Saxony, on the Löbber, 15 miles north of Leipsic. The manufactures are chiefly woolen goods; several important fairs are held each year. Pop. 9,560.

Delius, dā-lē-oos, **Nikolaus,** German Shakespearian critic: b. Bremen 19 Sept. 1813; d. Bonn 18 Nov. 1888. He studied philology at Bonn and Berlin, and in England and France. He settled in 1846 in Bonn, where he became extraordinary professor in 1855, and professor in 1863. He published a critical edition of Shakespeare (1854–61).

Delivery, in law (1) the delivery of a deed, or the handing of it over to the grantee, which is expressed in the attestation, "sealed and delivered," and is one of the requisites to a good deed. A deed takes effect only from this delivery; for if the date be false or impossible, the delivery ascertains the time of it. A delivery may be either absolute, that is, to the grantee himself, or to a third person, to hold till some conditions be performed on the part of the grantee. In certain cases, as wills, bonds made by a parent in favor of his children, or deeds in which the grantee has himself an interest, or where there is a mutual obligation between the parties delivery is not required. (See DEED.)

(2) An expression peculiar to England, also called jail delivery, a term applied to the sessions at the Old Bailey, London, or the assizes, when the jail is delivered or cleared of the prisoners.

Delivery. See OBSTETRICS.

Della Cruscans, dĕl'la krŭs'kanz, a coterie of English poetasters resident about 1785 in Florence (and so named from the Accademia della Crusca of that city), who took to penning verses, which they published under the name of the 'Florence Miscellany.' Notwithstanding the inconceivable silliness and affectation of these productions they found numerous admirers. The newspapers of the day began to give publicity to their lucubrations. Genuine poetry seemed for a time at a discount, and nonsense and Della Crusca prevailed. The frenzy was, however, of short duration. The 'Baviad' (1794) and 'Mæviad' (1796) of William Gifford swept the butterfly Orlandos, Carlos, Lauras, Marias, "and a thousand other nameless names" into merited oblivion.

Della Maria, Dominique, dōm-ē-nēk dĕl-lä mä-rē-ä, French musician: b. Marseilles 1768; d. Paris 9 March 1800. He was very precocious, but his fame rests upon the score he wrote for 'The Prisoner' by Duval.

Della Robbia, Luca. See ROBBIA, LUCA DELLA.

Della Robbia Ware, brown terra-cotta bas-reliefs thickly enameled with tin-glaze; made at Florence (chiefly in 1450–1530); in France (1530–67); so called from the name of the artist and its attributed inventor, Luca Della Robbia. The most important and largest work in this ware, perhaps, is the frieze on the hospital at Pistoia, made after the artist's death. At Tamworth, England, there is a plant, founded in 1847, that turns out this style of pottery, especially for architectural decorations, with great success.

Dellys, dĕl-lēz', Algeria, a seaport in the department of Algiers, 49 miles east of the city of Algiers. The inhabitants are mostly French and Arabs. It contains the mosque of the Mohammedans and the mission school of the Christians. The trade is principally in grain, oil, and salt. Pop. 3,987.

Delmar, Alexander, American political economist: b. New York 9 Aug. 1836. He established the 'Social Science Review' and was its editor in 1864–6. He is the author of 'Gold Money,' and 'Paper Money' (1862); 'Essays on Political Economy' (1865); 'Letter on the Finances' (1868); 'History of Money in Ancient Countries' (1884); 'The Science of Money'; 'The National Banking System'; 'Statistical Almanac'; 'The History of Money in America' (1899); etc.

Delmonte y Tejada, Antonio, än-tō'nē-ō dāl-mōn'tā ē tä-hä'dä, Dominican historian: b. Santiago de los Caballeros, Santo Domingo, 29 Sept. 1783; d. Havana 19 Nov. 1861. He is the author of 'Historia de Santo Domingo' (1853), a history of the island from its discovery.

Delolme, Jean Louis, zhŏn loo-ē dė-lōlm, Swiss writer: b. Geneva in 1740; d. Switzerland 16 July 1806. He at first practised as a lawyer in his native city, but the part which he took in its internal commotions obliged him to go to England, where he passed some years in great poverty. He became known by his once-celebrated but superficial 'Constitution de l'Angleterre,' translated by the author himself into English in 1772. Delolme also published in English his 'History of the Flagellants or Memorials of Human Superstition' (1783); an 'Essay on the Union with Scotland' (1796). He returned to Switzerland about 1775.

De Lome, Enrique Dupuy, ĕn-rēk' dü pwē' dė-lōm, Spanish diplomatist: b. Valencia, Spain, August 1851; d. Paris, France, July 1904. He became first secretary of the Spanish legation in Washington in 1882, and minister to the United States in 1892 and 1895. In February 1898 it was discovered that he had written a letter to Señor Canalejas, a Spaniard of high rank who had been in the United States a short time previous supposably to make observations for the Spanish government. The letter, which followed Canalejas to Havana, and was

probably abstracted from his apartments there by some friend of the insurgents, contained disparaging phrases regarding the President of the United States, and otherwise plainly showed that neither the writer nor the recipient of it believed that Spain was acting in good faith with the United States government. De Lome at first denied the genuineness of the letter, but it was proved beyond a doubt that he was the author, and he telegraphed his resignation to Madrid on February 9.

De Long, George Washington, American naval officer and Arctic explorer: b. New York 22 Aug. 1844; d. Siberia 30 Oct. 1881. Graduating from the Naval Academy in 1865, he reached the grade of lieutenant-commander, and perished of cold and exposure while in command of the Jeannette Expedition in 1879–81. His journals have been published, entitled 'The Voyage of the Jeannette' (1883); and the story of the search for the survivors is told in Melville's 'In the Lena Delta' (1884).

Deloo', an African antelope, one of the duiker-bok (q.v.).

Delorme, Marion, mā-rē-ôṅ dė-lôrm, French courtesan: b. Blois 3 Oct. 1613; d. Paris 2 July 1650. Her beauty and wit soon made her house the rendezvous of all that was gallant and brilliant in Paris. The king, the princes of Condé and Conti, Buckingham, Cinq-Mars, St. Evremont, were among her admirers. The leading spirits of the Fronde regularly assembled in her house, and she is said to have assisted them in their enterprises. Mazarin was about to have her arrested when she died suddenly. The legend arose in France that the death and funeral were a mere pretense, got up to permit her to make her escape. She is said to have crossed over to England and married a rich lord, who shortly afterward died. She then returned to France, married a chief of brigands, who was captivated by the charms of his victim. After his death she married a procurator of finance in Franche-Comté, with whom she spent 22 years of her life. Upon his death prosperity forsook her. Plundered by adventurers and her own servants, she died in extreme poverty in 1706, or according to another story in 1741, at the age of 129 years. Victor Hugo has taken her as the subject of one of his dramas.

De l'Orme, Philibert, fē-lē-bār, French architect: b. Lyons 1515; d. Paris 8 Jan. 1570. He studied in Rome, aided by Cardinal de Ste. Croix, and became the favorite architect of Henry II. and Diane de Poitiers. On the death of Henry II. he remained in disfavor for some time. He began the Tuileries for Catharine de Medici. The Château d'Anet, begun in 1552, is one of his chief works. He wrote two books which were long a high authority on architecture.

Delorme, Pierre Claude François, pē-ār klōd fraṅ-swā, French genre painter: b. Paris 28 July 1783; d. there 8 Nov. 1859. He was a pupil and imitator of Girodet. Among his works are: 'Death of Abel' (1810); 'Hero and Leander' (1814); 'Raising of Jairus' Daughter' (1817), in Church of St. Roch, Paris; 'Christ Reappearing' (1819), in Notre Dame, Paris; 'Cephalus Carried Off by Aurora' (1882), in the Luxembourg; 'Hector Reproaching Paris' (1824); 'Sappho Reciting an Ode to Phaon' (1833); 'Eve Plucking the Forbidden Fruit' (1834); 'Magdalen at the Sepulchre' (1835); 'Adam and Eve After the Fall' (1839); 'Holy Family in Egypt' (1850).

Delort, Charles Edouard, sharl ā-doo-ār dė-lôr, French painter: b. Nimes 4 Feb. 1841; d. 10 March 1895. He was a pupil of Gleyre and of Gérôme. Among his works are: 'Daphnis and Chloe'; 'The Stolen Cattle' (1866), Museum of Nimes; 'Confidence'; 'Starting for the Chase' (1873); 'Marauders' (1874); 'Embarking of Manon Lescaut' (1875); 'After Breakfast' (1876); 'A Poacher'; 'Admonition' (1880); 'Capture of the Dutch Fleet by the Hussars of the French Republic' (1882); and 'Return from Exile' (1889).

Delos, dē'lŏs (ancient ASTERIA; CYNTHUS; ORTYGIA), the central and smallest island of the Cyclades, in the Ægean Sea, a rugged mass of granite about two square miles in extent. Delos, according to old legends, was raised from the sea-bottom by Poseidon. It was then a naked rock floating about in the ocean, and was accidentally driven by the waves into the centre of the Cyclades. The Earth had promised Hera (Juno), with an oath, not to grant a resting-place to the fugitive Latona where she might be delivered. The unhappy goddess wandered restlessly over the earth until she perceived the floating island. As this was not stationary, it was not comprehended in the oath of the Earth, and offered her an asylum. Here Latona bore the infant gods Apollo (who was hence called *Delios*) and Artemis (who was called *Delia*). Both were worshipped on this island. Delos was thenceforth no longer the sport of the winds; it was moored to the bottom of the Ægean with adamantine chains by Zeus, and the fame of the isle spread over the world. Thus far mythological tradition.

At an early period the island, occupied by the Ionians, had kings of its own, who also held the sacerdotal office. In the course of time it came under the dominion of Athens. In 477 Delos became the common treasury of the league against Persia, but the money was afterward transferred to Athens. In 426 the Athenians purified Delos by removing all the tombs, and thenceforth they prohibited births and deaths from taking place on the island. In 422 they removed all the Delians from the island in order to complete its purification, but soon afterward these were allowed to return. After the destruction of Corinth the rich Corinthians fled thither, and made Delos the seat of a flourishing commerce. Delos had a famous temple of Apollo, built of Parian marble, and containing, besides the beautiful statue of the god, a remarkable altar, from which the Delian problem (Doubling the Cube), as it is called, had its name. The inhabitants, having consulted the oracle concerning the remedy of a plague which raged in Delos, were ordered to double the altar of Apollo, which was a cube. A solution of this problem of the duplication of the cube was attempted in different ways by several of the ancient mathematicians. The Grecians celebrated the Delian festival here every five years; and the Athenians performed annually the pilgrimage called *theoria*, with processions and dances. Delos was celebrated in ancient times for the number and the excellence of its artists, and workers in silver and bronze. Cicero, in his

oration for Roscius, has many eulogiums upon the fine vases of Delos and Corinth. Delos, called Dili or Sdili, is now without permanent inhabitants; a few shepherds from the neighboring islands pay it summer visits with their flocks. Some ruins of its former magnificence yet exist. Among these are remains of the Temple of Apollo above referred to, of one to Latona, of an amphitheatre, etc., besides a curious primitive temple of Apollo, called the Cave of the Dragon, which is not a real cave.

Since 1877 the French School at Athens has been making excavations on the island of Delos, largely under the direction of Théophile Homolle. The procedure has been slow and economical and the results excellent. Homolle, who previously carried on excavations at Delphi, was appointed by President Loubet director of the Louvre Museum. According to the report made to the Institut de France by Prof. Dürbach, Delos is the only ancient Greek city that remains approximately intact. It may almost be termed the Greek Pompeii in view of the scientific results which it has yielded. The complete plan of the sacred precinct of Apollo has been recovered; together with the theatre, the temple on Mount Cynthus, the temples of foreign gods, and an extensive part of the commercial section of Hellenistic and Roman days. Sculpture of all periods has been found in abundance, as well as inscriptions throwing light on various points of discussion. Joseph Florimund, Duc de Loubat (Papal nobility), an American, placed at the disposal of Homolle a yearly sum of $10,000 to continue until the excavations are finished.

From the ancient mole, there is an approach to the precinct of Apollo through an avenue flanked by porticoes. The temple of Apollo is the centre of the precinct. It is a Doric work, with 13 columns at either side, and 6 in front and rear; and having comparatively few sculptural decorations. It dates from the early 4th century B.C. The decorative groups on the two gables have been in part recovered, and are now in the National Museum, Athens. To the north of the precinct of Apollo are large remains of the commercial Delos. In the 2d and 1st centuries B.C., Delos was the chief commercial town of the eastern Mediterranean. The most extensive building in this region is a kind of exchange, with a very large court encircled by apartments. The shore, facing Rhenea, is lined with docks and warehouses. A well of six metres in depth was found filled with tablets of marble and bronze, having upon them 20 ancient inscriptions regarded as of great value. The sanctuaries contain exvotos, stelæ, and inscriptions on marble and bronze giving in full detail accounts of the high priests and catalogues of the offerings brought by pilgrims. Streets, gardens, and sewage canalization may all be distinctly traced. Interesting private houses have also been discovered. Mention should also be made of the long and narrow hall, extending north and south and entered through a portico at its southern end, having at its northern end the famous "altar of horns," composed of the horns of the victims and accounted one of the seven wonders of the world. The entire building is often called "The Sanctuary of the Bulls," from the design of the capitals of the two columns separating the altar from the remainder of the hall. Consult Homolle, 'Les Archives de l' Intendance Sacrée de Délos'; Diehl, 'Excursions in Greece' (Eng. trans. by Perkins 1893); 'Bulletin de Correspondance Hellénique' (1877).

Del'phi, the seat of the most famous oracle of ancient Greece, was situated in Phocis, on the southern side of Parnassus. Apollo, according to fable, having killed the serpent Python, and determining to build his sanctuary here, perceived a merchant vessel from Crete sailing by. He immediately leaped into the sea in the form of an immense dolphin (Greek, *delphis*), took possession of the vessel, and forced it to pass by Pylos, and to enter the harbor of Crissa, not far from Delphi. After the Cretans had landed he assumed the figure of a beautiful youth, and told them that they must not return to their country, but should serve as priests in his temple. Inspired, and singing hymns, the Cretans followed the god to his sanctuary on the rocky declivity of Parnassus; but, discouraged by the sterility of the country, they implored Apollo to save them from famine and poverty. The god, smiling, declared to them the advantage which they would derive from serving as his priests. They then built Delphi, calling the city at first Pytho, from the serpent which Apollo had killed at this place.

The oracles were delivered from a cave called Pythium. Tradition ascribes its discovery to a shepherd who pastured his flocks at the foot of Parnassus,and was filled with prophetic inspiration by the intoxicating vapor which arose from it. Over the cave, which was contained in a temple, was placed the holy tripod, upon which the priestess called Pythia, by whose mouth Apollo was to speak, received the vapors ascending from beneath, and with them the inspiration of the Delphian god, and proclaimed the oracles (hence the proverb, to speak *ex tripode*, used of obscure sentences, dogmatically pronounced). After having first bathed herself, and particularly her hair, in the neighboring fountain of Castalia, and crowned her head with laurel, she seated herself on the tripod, which was also crowned with a wreath of the same, then, shaking the laurel tree and eating perhaps some leaves of it, she was seized with a fit of enthusiasm. Her face changed color, a shudder ran through her limbs, and cries and long protracted groans issued from her mouth. This excitement soon increased to fury. Her eyes sparkled, her mouth foamed, her hair stood on end, and almost suffocated by the ascending vapor, the priests were obliged to retain the struggling priestess on her seat by force; then she began, with dreadful howlings, to pour forth detached words, which the priests collected with care, arranged them, and delivered them in writing to the inquirer. At first the answers were given in verse, or were put into hexameters by priests of the temple who were poets, but in later times, the authority of the oracle being diminished, they contented themselves with delivering them in prose.

This oracle was always obscure and ambiguous; yet it served, in earlier times, in the hands of the priests, to regulate and uphold the political, civil, and religious relations of Greece. It enjoyed the reputation of infallibility for a long time; for the Dorians, the first inhabitants of the place, who soon settled in all parts of Greece, spread an unbounded reverence for it. At first only one month in the year was assigned for the

delivery of oracles, afterward, one day in each month, but none who asked the god for counsel dared approach him without gifts. Hence the splendid temple possessed immense treasures, and the city was adorned with numerous statues and other works of art, the offerings of gratitude. Delphi was at the same time the bank in which the rich deposited their treasures, under the protection of Apollo, though this did not prevent it from being repeatedly plundered by the Greeks and barbarians. Although the sanctuary and its treasures had been almost miraculously preserved from the Persians and Gauls, they were forced by Sulla to contribute to the payment of his soldiers, and Nero removed 500 brazen images from the sacred precincts. Constantine the Great enriched his new city by the sacred tripods, the statues of the Heliconian Muses, the Apollo, and the celebrated Pan dedicated by the Greek cities after the conclusion of the war with the Medes.

The ancients believed Delphi to be the centre of the earth: this, they said, was determined by Jupiter, who let loose, from the east and from the west, two eagles, which met here. The tomb of Neoptolemus (or Pyrrhus), son of Achilles, was at Delphi, and near it the famous Lesche, adorned by Polygnotus with the history of the Trojan war. In the plain between Delphi and Cirrha the Pythian games were celebrated. These national games, and the protection of the Amphictyons, gave Delphi a lasting splendor. It is now a village called Castri, near which the Castalian spring may still be seen.

In 1892 the site of Delphi, until that time occupied by the village of Castri, was purchased by the French government, a new village was established farther westward, and the French School at Athens, under the direction of Théophile Homolle, began important excavations. The entire precinct has been revealed, and, with the assistance of Pausanias' 'Itinerary,' many structures have been identified, including the altar, temple, stadium, theatre, treasuries, and other buildings. More than 3,000 inscriptions have been found, many of great value for Grecian history. The sculpture discovered contributes much to the history of art in the late 6th and early 5th century B.C. The ancient wall (the Hellenico), extending east and west, has been recovered in its entire length, and the two boundary walls, climbing the hill at either end of the Hellenico, have been traced. The main entrance was in the eastern of these two walls, and from this the Sacred Way proceeds by a zigzag course to the temple. Just within the precinct wall, on the northern side of the Sacred Way, stood the large building dedicated as an offering by the Lacedæmonians after the battle at Ægospotamos (q.v.). To the west, on the southern side of the way, was the Sicyonian treasury, in the form of a Doric temple, distyle *in antis*. Still farther westward, on the same side of the way, is the Cnidian treasury, originally a small marble Ionic temple, distyle, with a sub-structure of tufa. The sculpture from the pediment and frieze of this building, and the fragments of moldings, are of very considerable interest. The structure has been described as perhaps the most nearly perfect extant example of the transitional style of the early 5th century B.C. Here the Sacred Way makes a decided turn; and farther north, but still on the same side of the way, is the Athenian treasury — a Doric temple *in antis*, of small size, with a basis bearing the remains of a dedicatory inscription which announces that it was built with the spoils from the battle of Marathon (q.v.). It was on stones in this treasury that the hymns to Apollo with ancient musical notation were found. Beyond this treasury was the many-fluted "Column of the Naxians," which supported the colossal marble sphinx, now in the museum.

The site of the temple shows the remains of various successive buildings. Many remains have been recovered of that built by the Alcmæonidæ (6th century), which was destroyed by an earthquake. Some archaic sculptures discovered have been assigned to the gables of this structure. The foundations now extant are those of the temple built in the 4th century. No definite information can be gained as to the oracle. The theatre, in the northwest corner of the precinct, dates from the early 2d century and is one of the best preserved in all Greece. The walls and seats of the auditorium remain; there are 33 tiers of seats arranged in seven sets, with a paved longitudinally-intersecting passage, or diazoma. Consult the 'Bulletin de Correspondance Hellénique,' and the 'Comptes Rendus de l'Académie des Inscriptions.'

Delphi, Ind., a city of Carroll County, of which it is the county-seat, about 20 miles southwest of Logansport, and 60 miles north by west of Indianapolis; on the Wabash River and the Louisville, New Albany, and Chicago, the Wabash, and other railways. The water-power is excellent. There are lime-works, the lime interests being extensive; besides paper-mills, wagon and carriage manufactories, flour and planing-mills, and a bent-wood factory. Pop. (1890) 1,923; (1900) 2,135.

Delphin (del'fin) **Classics** (*Auctores Classici in usum Serenissimi Delphini*), a collection of the works of the Latin classic authors, prepared by order of Louis XIV., at the suggestion of the Duke of Montausier for the use of the dauphin of France. The Duke of Montausier was the dauphin's governor, and in making a selection of authors, texts, and editors, employed the services of Bossuet, "the Eagle of Meaux," and Huet, bishop of Avranches, both preceptors to the young prince. This collection of the Latin classics does not comprise all the works of Latin writers that are extant, and it contains a few authors to whom the title classic can be given only by a very generous interpretation of the word. A notable omission of a genuine classic is the 'Pharsalia' of Lucan, which seems to have been dropped, as having no place in the library of the heir of an absolute monarch. The series was completed in 64 volumes 4to, including a 'Dictionary of Antiquities' in one volume. The text is accompanied by copious explanatory notes (in Latin), and, in the case of all poets and of difficult prose writers (Tacitus, for instance), by an interpretation in easier Latin. The same is done in the case of all difficult phrases occurring anywhere in the prose authors. The complete works of the several classics, as far as extant, are given; as well as the spurious works commonly attributed to them. A valuable feature of this collection is the very complete verbal index to the works of each author. In the years 1819–30

Valpy, of London, republished the Delphin Classics, with the whole of the notes and interpretations, but usually with the texts as amended by later critical research. To the notes of the Delphin edition Valpy added very voluminous *Notæ Variorum*. These last far exceed in bulk both the text and notes of the original Delphin Classics.

Delphine, dĕl-fēn, a romance by Madame de Staël, published in 1802. Its bold imagery, keenness of observation, and power of impassioned description, perhaps justify 'Delphine's' position among the masterpieces of French literature. But neither situations nor characters are true to nature. The romance had a special interest for Madame de Staël's contemporaries, for several of the great men and women of the time appear in it under the thinnest of disguises. As in the case of «Corinne,» the liberal ideas scattered through the story drew down on the author the anger of Napoleon, who ordered her to leave France.

Delphin'ia, a festival celebrated in honor of Apollo (Delphinios being one of his names) at Athens, on the 7th of the month Munychion (April). On this occasion a procession of girls bearing garlands, marched to the temple of the god to seek his favor more especially, perhaps, in the interests of seamen.

Delphin'idæ, the dolphin family of cetaceans. See DOLPHIN; NARWHAL; PORPOISE.

Delphin'ium, a genus of beautiful annual and perennial plants of the crowfoot family (*Ranunculaceæ*), with large irregular flowers, comprising about 60 species, natives for the most part of the north temperate zone; some few species are found in the mountains of Mexico. The name is a reference to the supposed resemblance to a dolphin. The genus is represented in America by about 25 species, which are known as larkspur, with blue or purple flowers, rarely white. The field larkspur (*D. consolida*) is found in waste places in southern New Jersey, Pennsylvania and farther southward, naturalized from Europe. It has for a companion at times (*D. Ajacis*) the cultivated larkspur, which has escaped from gardens. The cultivated plants have shorter spurs and longer and denser racemes of flowers. The tall larkspur (*D. urecolatum*) is found in the woods of central Pennsylvania, west to Minnesota, south to Nebraska, northern Alabama, and North Carolina. Other species extend the habitat of the genus, north to Manitoba and south and west to Texas. From the European (*D. staphisagria*, staveacre) is extracted an alkaloid known as delphinine. The field larkspur is a simple astringent.

Delphinus, dĕl-fī'nŭs (the dolphin), one of Ptolemy's original 48 constellations, situated between Vulpecula, Pegasus, Equuleus, Aquarius, and Aquila. It has no stars brighter than the third magnitude. The names Sualocin and Rotanev assigned to its stars Alpha and Beta, are merely reversals of the name Nicolaus Venator, an astronomer's assistant, who wished to commemorate himself.

Delphos, Ohio, city in Allen and Van Wert Counties, situated on the Miami & E. C., the N. O., the Pittsburg, Ft. W. & C., and other railroads; about 70 miles southwest of Toledo. The principal industries of the city are the Fort Wayne railroad repair shops, and manufactures of furniture and wooden ware. Pop. (1900) 4,517.

Del Rio, dĕl rē'ō, Texas, county-seat of Vel Verde County; about five miles from the Rio Grande River; on the Southern Pacific Railroad. Its industries are those of an agricultural and stock-raising region, and it has several small cotton and wool manufacturing plants. Pop. (1900) 2,500.

Delsarte, François Alexandre Nicolas Chérie, frän-swä ä-lĕks-ändr nĭk-ō-lä shā-rē dĕl-särt, French educator: b. Solesmes 19 Dec. 1811; d. Paris 19 July 1871. He attained distinction as a tenor singer in the Opéra Comique, suddenly lost his voice, and thereafter applied himself to musical and dramatic instruction, having among his pupils many who afterward achieved operatic and dramatic celebrity. He was author of several melodies and romances, but his chief work was the elaboration of a system of dramatic expression, by which the voice and entire action of the body were trained by fixed rules. He aimed to make elocution a science. His system, at least in part, has of late been gaining many adherents among elocutionists.

Delsarte Method. See GYMNASTICS.

Delta, the name of the fourth letter of the Greek alphabet, the capital form of which is an equilateral triangle. The name is also applied to a tract of land triangular in shape, generally formed by the deposit of river sediment, especially at the mouths of rivers which flow into lakes or seas. A mountain stream changing the force and rapidity of its current upon entering a level plateau deposits at the base of the mountain sediment which assumes the triangular form and is called a cone-delta or a fan-delta, or an alluvial fan.

The nature of the current in the body of water receiving the river deposit has much to do with the size of the delta. A swiftly-flowing current or high tides carry off the deposit from the shore line, sometimes forming long coast islands or sand-bars or sand-spits, or distributing the sediment over the ocean bed; but slowly moving waters are conducive to large deltas. The almost tideless Mediterranean and Gulf of Mexico have deltas at the mouths of the large rivers which bring deposits to the sea. Usually the finest particles of land waste are swept away by currents, but the rest accumulates at the mouth of the river and builds up a fan-shaped land mass, or delta, in front of the old shore line. Old rivers that bring down much sediment, may, if the coast is neither uplifted nor depressed, build deltas of great size. In the case of a river emptying into a sea even the fine waste brought down falls to the bottom before long, as the salts in the sea water precipitate matter in suspension. The river usually enters the sea over the front of its delta by several channels, these branches of the main stream being called distributaries. An excellent example is the way the Mississippi divides up at its mouth. As a large river bringing down waste can build a delta even where waves and tidal currents are active in distributing the material, the absence of a delta at the mouth of a large river indicates generally some recent change of level. Thus the absence of deltas along the Atlantic coast of the United States is due to a slow depression of the coast, still in progress. This submergence of the coast has

a tendency to create estuaries at the mouths of rivers. Some notable deltas are those of the Po, Hoangho, Ganges, and Niger. As showing how rapidly a delta may grow, Adria in Italy was a seaport in the time of Augustus, but the growth of the Po delta has left it 20 miles inland. The Mississippi delta is advancing into the Gulf of Mexico at the rate of one mile in 16 years. The Mississippi delta is, in area, about 12,500 square miles; that of the Nile about 10,000 square miles. Large rivers frequently change the channel of their distributaries, thus making the deltas unsafe for dwelling places. Consult: Geikie, 'Elementary Lessons in Physical Geography,' and 'Text Book of Geology'; Tarr, 'Physical Geography.'

Delta Metal, an alloy containing 56 parts of copper, 42 of zinc, and 2 of iron. It is said to be as strong as mild steel, over which it has the advantage of not rusting by exposure to the weather. Delta metal is largely used in England and Germany, and is also employed in the United States, though to a more limited extent.

Delta Territory, Venezuela, the delta of the Orinoco River, bounded on the north and east by the Gulf of Paria, the Atlantic Ocean, and British Guiana; on the south by the Yuruari territory; on the west by the Maturin section of the old state of Bermudez (now divided into states of Barcelona and Sucre). Its numerous streams and low-lying coasts are not well adapted to navigation of large vessels. Pedernales, a small town on the Gulf of Paria, is the capital. Pop. of territory about 2,500.

Deltoid Muscles. See MUSCLES.

Deluc, Jean André, zhŏñ äñ-drā dė-lük, Swiss geologist and meteorologist: b. Geneva 8 Feb. 1727; d. Windsor, England, 8 Nov. 1817. He passed the first half of his life in commercial pursuits. In 1773, obliged by commercial disaster to quit his native city, he went to England, was elected a Fellow of the Royal Society of London, and appointed reader to the queen, a situation he held for 44 years. He made numerous geological excursions in central Europe and in England, of which he has published accounts. He enriched science with very important discoveries. Among his numerous writings are his 'Recherches sur les Modifications de l'Atmosphère' (1772); 'Nouvelles Idées sur la Météorologie' (1786); 'Traité élémentaire de Géologie' (1810).

Deluge (through the French, from Lat. *diluvium*, "a flood"). There is scarcely any considerable race of men among whom there does not exist, in some form, the tradition of a great deluge, which destroyed all the human race except their own progenitors. The classical story of Deucalion and Pyrrha is but a typical example of similar myths found everywhere, and savages and fathers of the Church alike have argued that the shells, corals, and other marine objects often found on the tops of mountains, offered distinct proof of the historical reality of a deluge. That the Noachian deluge recorded in Scripture covered the whole earth and destroyed all mankind save one family, was the universal opinion until toward the close of the 18th century. The organic remains, on which the science of palæontology is now founded, were regarded as its wrecks, and were held to prove that it had covered every known country, and risen over the highest hills. In the progress of geology, it soon became evident that most of the stratified rocks demanded an earlier origin than a few thousand years, and the influence of the deluge was consequently restricted to the slightly altered superficial deposits; but many of these were, after a few years, found to belong to a period vastly anterior to any historical epoch, and to have been produced by long-continued and persistent agencies, differing totally from a temporary cataclysm. The more common modern opinion regards the flood of Noah as partial and local, although the universality seems fairly enough to be implied in the biblical description, and although the old theory has been revived by writers of some authority, other noted men have argued and maintained the partial character of the flood from the absence of all record of a deluge among the black races of the world, as the negroes and Papuans, asserting that this opinion is quite consistent with the exegesis of Scripture, with tradition, and the doctrine of the Church, while it is the only theory that avoids all the ethnological and linguistic difficulties presented by the existence of the great negro and yellow races marked off so distinctly from the Noachian type. The deluge traditions of many primitive races are connected with religious mysteries, and it is scarcely true, as has often been asserted, that it is the Old Testament alone that gives a moral reason for the deluge sent upon the world. The Chaldean account discovered by George Smith presents a striking resemblance to the Genesis story, and agrees with it also in making the flood distinctly a divine retribution for human sin, although it of course differs from the Jewish account in being polytheistic instead of monotheistic. The vessel in which Xisuthros, the Chaldean Noah, sails, is a ship guided by a steersman, and others beside his own family are admitted into it. The flood is seven days at its height, and Xisuthros sends out in succession a dove, a swallow, and a raven. The ship finally rests on Rowandiz, the highest mountain of eastern Kurdistan, and the peak which supports the heavens, instead of upon Ararat, the northern or Armenian continuation of the range. Babylonian tradition also confounds Noah with Enoch, for Xisuthros is taken to the skies immediately after coming out of the ark. Two deluge poems were amalgamated together in an Akkadian epic, in 12 books, describing the adventures of Gizdhubar.

Bibliography.— Buckland, 'Reliquiæ Diluvianæ'; Howorth, 'The Mammoth and the Flood'; Lenormant, 'Histoire Ancienne de l'Orient'; Motais, 'Le Déluge Biblique.' Compare: Sayce, 'Fresh Light from the Ancient Monuments'; Prestwitch, 'On Certain Phenomena Belonging to the Close of the Last Geological Period.'

Deluge Tablet, or **Deluge Tablets**, the name given to the tablet or tablets (the 11th of the Izdubar Legends) inscribed with cuneiform writing, which being translated is found to contain the Chaldean account of the deluge. Perhaps it may have been originally Acadian. A paper on the subject was read by George Smith, of the British Museum, before the Society of Biblical Archæology, on 3 Dec. 1872, and a revised translation published in 1874. What Mr. Smith called the Flood-hero was Adra-hasis. In Babylonian proper names compounded of two elements, either might at pleasure be placed first.

Reversing the relative positions of the two elements, the name becomes Hasis-adra, which being imperfectly heard by the Greeks was by them written Xithurus or Xisuthrus.

Delun'dung (native name), the linsang or weasel-cat (*Prionodon gracilis*), a small quadruped inhabiting the vast forests of the eastern extremities of Java and Malacca. It is of pale yellowish-white color, with elegantly marked stripes and bands of a deep brown. It is allied to the civets, but is destitute of a scent-pouch.

Delusions. A delusion is a mental state in which the mind, reasoning from definite facts, arrives at erroneous, undemonstrable, and perhaps foolish conclusions, and is unable to modify these conclusions, whatever proof may be brought to show their falsity. Thus a patient suffering from delusions may read into the actions of others ideas and conclusions relating to himself that have no basis in actual logic. Seeing several people on a corner, a man with persecutory delusions may infer that they are gathering to do him harm, or planning to deprive him of his liberty, etc. See INSANITY.

Delyannis, dĕl-ī-ăn'ĭs, **Theodoros,** Greek statesman: b. Kalavryta, Peloponnesus, 1826; d. Athens 13 June 1905. He entered politics early in life and in his long career held many cabinet positions. While prime minister for the third time, 1895–7, he brought about the Græco-Turkish war, whose disastrous result obliged him to resign with his whole cabinet. He was stabbed by a professional gambler for the stringent measures taken by him against gambling houses.

Demades, dĕm-ā'dēz, Athenian orator: d. 318 B.C. Originally a fishmonger, he rose to high places in the republic. He was captured by Philip of Macedon in the battle of Chæronea, but soon set at liberty. He afterward exerted his influence in favor of the Macedonian party at Athens, but betraying Antipater, was put to death by Cassander, the son of the latter.

Dem'agogue (Gr. *demagogos*), one who leads or directs the people in political matters. In its original acceptation it was considered an honorable designation, and in this sense Pericles, Demosthenes, and Cicero were demagogues. On the other hand, the tanner, Cleon, satirized by Aristophanes in his play of the 'Knights,' is a portrait of the personage to whom the epithet in its bad sense is applied. It is a handy nickname to throw at a popular politician with whose views you have no sympathy. Usually an unprincipled orator or political agitator who curries popularity and power with the masses by pandering to their ignorance or prejudice.

Demand, a term in law, of comprehensive meaning. When referred to contracts it means a claim, a legal obligation. Its correlative is release, and a release of all demands is a release of all covenants real and personal, whether the conditions are broken or not, of all annuities, recognizances, obligations, and contracts. Demand, in the practice of law, is a requisition made by one individual to another to do a particular thing, namely, pay some debt, fulfil some contract, release some person or property. Demands are either express or implied. Sometimes an express demand is required before action can be taken, in other cases the law requires no more than the demand implied by bringing an action. Whether an express demand is required before a plaintiff can commence action to enforce fulfilment of a contract depends upon the express or implied stipulations of the parties to the contract. When no date is given in a contract for its fulfilment, whether in the case of a promissory note, or in the contracting of a debt, the payment of the obligation is due on the present day, or immediately on demand. It is requisite, in some cases arising *ex delicto,* that is, in some criminal cases, to make a demand for the restoration of the right before the commencement of an action, or, for instance, when the wife or other member of the plaintiff's household has been enticed away, in order to constitute the party a wilful wrongdoer, a demand for restoration must be made. When property lawfully obtained possession of is unlawfully detained, or converted, a demand for the delivery of its possession to the owner is requisite before an action can be laid. When an order to pay, or to do something has been made a rule of court, a demand for the payment of the money, or performance of the thing must be made before an attachment will be made for contempt. In like manner, before action can be taken for breach of promise of marriage, a demand for marriage must be made by the plaintiff, unless the defendant has married another person, or has refused to marry at any time. See CONTRACT; RECOGNIZANCES; RELEASE.

Demand and Supply, in political economy, the desire for services or utilities on the one hand, and the production or offer of them on the other, which tend to complete an act of exchange. Demand is commonly said to be relative to supply, but in reality it is reciprocal to it. Certain political economists qualify the term demand by the word effectual, but it is scarcely necessary to make such a limitation. A mere desire for objects has no commercial significance, but that desire simply which contemplates a mutual benefit. Thus the wish of a beggar to possess a diamond cannot affect the price of the article, as he can offer no desirable object in return. The intensity of demand, and the consequent effect upon values, will be proportionate to the necessity which exists for satisfying the demand. Different rules, therefore, will apply to the increase of price consequent upon increased demand and reduced supply in articles of voluntary use, and to the same rise in price when affecting articles of necessary use. The demand for the latter class of utilities is constant, and a deficiency in supply cannot be met by abstinence, except to a scarcely appreciable degree, whereas any considerable deficiency in the supply of articles of voluntary use is to some extent met by economy. Prices will, therefore, increase in different ratios according to the degree in which the commodities demanded are necessary or convenient. Thus the price of grain may rise, in the case of a bad harvest, from 50 to 100 per cent; cotton or wool, in similar circumstances, would certainly fluctuate, but not to anything like the same extent; wine would vary in price least of all; the deficiency in the last two commodities being artificially restored by the decrease of demand consequent on economy and abstinence. See POLITICAL ECONOMY.

Demar'atus, Spartan king. He succeeded his presumed father, Ariston, about 516 B.C.; but lost the throne, partly in consequence of a quarrel with his colleague, Cleomenes, and partly

on account of doubts which had been cast upon his real parentage. He retired into private life; but having afterward become a magistrate, was sitting in that capacity at the Gymnopædian games when Leotychides, who had supplanted him as king, sent tauntingly to ask him how he felt at a secondary place after having occupied the first. The boldness of his reply forced him to take flight, and he passed over into Asia, where he was well received by Darius. He afterward accompanied Xerxes on his expedition against Greece, and is said to have given counsel which, if listened to, would probably have made the issue of it very different from what it eventually proved.

Demarcation, Line of, the boundary established 4 May 1493 by Pope Alexander VI., who assigned to Spain all the lands she had discovered or might discover west of a line running from the North pole to the South, distant 100 leagues west of "any of the" Azores and Cape Verde Islands (provided such lands had not been in the actual possession of any other Christian king or prince up to the preceding Christmas), and to Portugal, on the same conditions, all the territory she had discovered or might discover east of the said line. The governments of the peninsula held that the Pope had sole and absolute authority to dispose of all countries inhabited by heathen peoples; moreover the papal bull *inter cætera* of 4 May 1493, under penalty of excommunication, forbade all persons without special permit to go "for the purpose of trade or any other reason" to the islands and mainlands thus granted exclusively to Spain and Portugal. After this territorial concession had been made, Portugal's possessions in the eastern hemisphere were called the East Indies, and those of Spain in the western hemisphere were called the West Indies. An extension of the papal gift of the Indies was made in the bull dated 25 Sept. 1493. A dispute arising in regard to the position of the line of demarcation, the two countries concerned sent commissioners to the Spanish city of Tordesillas, and on 7 June 1494 the commissioners agreed that the line should pass, north and south, 370 leagues west of the Cape Verde Islands. On the strength of this agreement, Portugal claimed and secured the eastern part of South America (see Brazil). After the Victoria returned to Seville (1522) from her voyage to the Moluccas, and so round the world, the Portuguese accused their rivals of having broken the treaty of Tordesillas. The Spaniards in reply said that the Spice Islands (Moluccas) were not within the limits of the Portuguese territory. To settle this important dispute, a congress was convened at Badajos in 1524. Commissioners of both countries were in attendance — Fernando Columbus, Sebastian Cabot, and others. The two main points to be decided were: (1) whether the line of demarcation should be drawn at the stated distance west of the western or eastern limit of the Cape Verde Islands; and (2) where it would pass on the opposite side of the earth. This Badajos junta failed to come to an agreement "owing to the Portuguese experts, who could not overcome this dilemma: If the line was pushed more to the west, Portugal would gain a greater part of Brazil; but she might lose all rights over the Moluccas, as the line, of course, had to be carried to the other hemisphere as well." The treaty of Vitoria, signed 19 Feb. 1524, provided that, inasmuch as some doubt existed between the sovereigns of Castile and the king of Portugal as to the possession and ownership of the Moluccas, there should be appointed by each one of the parties to the treaty "three astrologers and three pilots, and sailors, for the determination of the demarcation." A treaty negotiated at Saragossa and signed by representatives of the Spanish and Portuguese monarchs 22 April 1529 fixed the line of demarcation 297½ leagues east of the Moluccas, Spain selling for a stated sum whatever rights she had formerly claimed to possess in the Spice Islands, and agreeing for the future practically not to colonize, and expressly not to "trade there in any manner whatsoever." It did not seem necessary at that time to raise the question as to the location of the line in the New World, though it is plain that if the circle thus "determined from pole to pole" in the east had been logically completed, Portugal would have been excluded from the South American continent. The bearing of this matter upon Spanish rights in the Philippines is of special interest. The Molucca Islands, the Philippines, and, indeed, the western half of Australia lay within the Portuguese assignment, as a matter of fact. Therefore the principal Spanish settlements and explorations in the Far East appear to have been made in contravention of Portugal's treaty rights.

Consult: Blair and Robertson, 'The Philippine Islands,' Vol. 1.; Harrisse, 'The Diplomatic History of America'; Dawson, 'The Line of Demarcation of Pope Alexander, etc. . . . with an inquiry concerning the Metrology of Ancient and Mediæval Times,' in Proceedings of Royal Society of Canada, 1899.

Marrion Wilcox.

Demavend, dĕm-a-vĕnd′, a volcanic mountain, now extinct, of Persia, and the highest peak of the Elbruz chain, 45 miles south of the Caspian Sea, and about 40 miles northeast of Teheran. Its height, according to the most reliable measurement, is 18,464 feet. At a distance the mountain has the form of a smooth cone, and appears to slope evenly from top to bottom at an angle of 45°. The cone terminates in a crater of 85 yards in diameter, and nearly surrounded by jagged rocks, composed partly of basalt and partly of limestone and sulphur. This sulphur is an article of commerce. The basin within is almost entirely filled with snow. Around the base are many hot springs. William T. Thompson was the first European to ascend Demavend (1837).

Dembea, dĕm′bē-a or dĕm-bē′a, or **Tzana,** a lake of Abyssinia, in the western part of the country. It is about 50 miles long and 6,000 feet above the level of the sea. It contains many islands, one of which is a place of confinement for state prisoners. The Bahr-el-Azrek, the Abyssinian Nile, flows through it.

Dembinski, dĕm-bĕn′skē, **Henryk,** Polish general: b. Strzalkow, near Cracow, 3 May 1791; d. Paris 13 June 1864. In the year 1825 he became a member of the Polish diet, where he cast in his lot with the opposition party. On the outbreak of the revolution in that country (1830), he was made brigadier-general, and in the following year was nominated governor of Warsaw and commander-in-chief of the Polish army. On the fall of Warsaw in September

into the hands of the Russians, Dembinski made his escape. The Hungarian revolution of 1849 once more offered him a field for his activity, and he was appointed by Kossuth commander of the insurgent troops. He had the misfortune to lose the battle of Kapolna, and resigned his command, but consented to act under Görgei. After the capitulation signed by the latter at Villagos, and the resignation of Kossuth, Dembinski fled to Turkey.

Deme, dēm, a subdivision of ancient Attica and of modern Greece. The démoi were townships or hundreds, subdivisions of the phulai, and were equivalent to the Dorian *komai*, Latin *pagi*. The word really meant a country district, or a common name for divisions of the country, and in the time of Herodotus they were 100 in number in Attica (10 in each phulē), afterward 170; their origin was commonly referred to Theseus. The word dēmos early came to be applied to the commons, and survives significantly in our democracy and demagogue.

Demen'tia, a mental condition in which there is a breaking down or weakness of what originally was a competent mind. Dementia is usually a secondary condition, although primary and secondary forms are distinguished by alienists. Primary or acute dementia usually follows some violent physical or mental shock, which may paralyze the brain functions for a time or for life. Secondary dementias are those that follow other forms of the insanities, or are the result of senile changes. Acute primary dementia occurring in young adults is now spoken of as dementia præcox. The most characteristic symptoms are a somewhat vacant and expressionless face; confused memories, or loss of memory; excitement, which may alternate with periods of stupor; diminished sensibility to pain; loss of desire to eat, or else gluttony; incoherent thinking; stumbling, or muttering speech, or speechlessness; lowered reflexes, etc. Some patients may recover partially, but the usual history is that they remain permanently demented and pass into secondary demented states. Chronic dementias, it has been said, usually follow attacks of mental disease, which, as Maudsley says, "instead of passing away in their due season and leaving a clear mind, lapse by quick or slow steps of degeneration into terminal dementia. Comparative peace remains then, but it is the peace of a desert." Alcoholism, epilepsy, apoplexy, and nutritional changes all bring about chronic dementia. See INSANITY.

Demerara, dĕm-ė-rä'ra, The District of, one of the three parts into which British Guiana is divided. In the uplands coffee is produced, and in the lowlands sugarcane and rice; these being the principal articles of exportation. The capital of this district and of the colony as well is Georgetown, which sometimes is also called Demerara.

Demerara River, British Guiana, rises in the unexplored mountains of the interior, flows northward, and empties into the Atlantic at Georgetown. It is navigable for small vessels to a point about 150 miles above its mouth. The estuary of the Demerara forms a moderately good harbor. See GEORGETOWN.

Demesne, dė-mēn', or Domain (in French *domaine*), in its popular sense, denotes, under a feudal aristocracy, the lord's domain, his manor place, with the lands thereto belonging. In England the demesne of the crown denotes either the share reserved to the crown in the distribution of landed property at the time of the Conquest, or such as came to it afterward, by forfeitures or other means. They are at present contracted within a very narrow compass, having been almost entirely granted to private subjects. The rents and profits of the demesne lands of the British crown are no longer kept separate, but are incorporated with the ordinary revenue. See CIVIL LIST.

The alienation of the domains in France, rendered necessary to reward powerful supporters, was the main cause of the fall of the Carlovingian dynasty. The succession of the Capets was likewise due to their great possessions, which rendered them the most powerful nobles in France. The policy of this house, particularly of Louis XI. of the Valois branch, in despoiling the great nobles, made them at length absolute masters of the kingdom, although at first their authority, beyond their own domains, was very feeble. The despotic power of the French monarchy reached its climax under Louis XIV., the most powerful of the Bourbon branch of the family. The nobility had now lost nearly all its feudal privileges, and could easily be rewarded by places at court, appointments in the public services, and pensions out of the national revenue. Napoleon, who endeavored as much as possible to revive the traditions and institutions of the monarchy, had also a *domaine extraordinaire* (law of 30 Jan. 1810), which consisted of his acquisitions by conquests, and were kept entirely at his disposal; these supplied the means of donations to his generals, etc. The *domaine extraordinaire* was likewise retained by the Bourbons (law of 22 May 1816). The administration of these donations was conducted with great wisdom; and Napoleon, as Las Casas relates, dwelt with pleasure on this branch of his government.

Demeter, dė-mē'tėr, one of the twelve principal Grecian deities, the great mother-goddess, the nourishing and fertilizing principle of nature. She was the daughter of Cronos and Rhea, and mother of Persephone (often called Cora, the Maiden, the Proserpine of Roman mythology), and according to Hesiod, of Dionysus (Bacchus). By later writers Demeter is represented as being the wife of Dionysus. The main feature in the mythus of Demeter, and that which forms the fundamental idea of her worship, is the loss and recovery of her daughter, Persephone. Zeus, without the knowledge of Demeter, had promised Persephone to Pluto, who carried her off as the earth opened in a field where Zeus had caused some flowers to grow to tempt the unsuspecting maid. Her mother, who heard the echo of her cries, but did not see who had carried her away, sought for her in vain over the earth, till Helios told her that Pluto had carried her off with the connivance of Zeus. Demeter vowed never to return to Olympus until her daughter accompanied her. Zeus sent first Iris, and then all the gods, to implore her to return, but without success; at last, fearing lest the race of mortals should perish, she having afflicted the earth with sterility, he despatched Hermes to Erebus to bring back Persephone. Pluto consented to her return, but gave her a pomegranate, and she

having eaten of the fruit of Erebus, was compelled thenceforth to spend a part of every year in the infernal regions. Hermes conducted her to her mother at Eleusis, and Zeus sent Rhea to urge Demeter to revisit Olympus, and tell her that he had consented that Persephone should remain two thirds of the year with her mother, the remaining third (the winter season) being passed with Pluto. Demeter now consented to return and to restore fertility to the earth; but before departing from Eleusis, which she had made her abode, she taught Triptolemus how her worship was to be conducted, and initiated him into the mysteries of the Eleusinia. In ancient monuments Demeter is represented as a beautiful matronly woman, with a mild and benevolent expression of face; she is always enveloped with ample drapery, which is usually close up to the neck; sometimes, however, one of her breasts is left exposed. Prof. Max-Muller identifies her with the Sanskrit *Dyûrâ Mâtar* (the Dawn). By the Romans she was identified and worshipped with Ceres (q.v.).

Demeter, Dimitrija, dē-mē-trē'zhä dē-mē'-tėr, Croatian dramatist and poet: b. Agram 21 July 1811; d. there 24 June 1872. His principal dramas are: 'Love and Duty'; 'Blood-Revenge'; and the tragedy 'Teuta.' He wrote a lyro-epic poem, 'The Battlefield of Grobnik,' and several stories. He translated several foreign dramatic works into Croatian.

Demetrius I., surnamed **Poliorcetes,** king of Macedonia: d. Pella, Syria, 284 B.C. He appeared before Athens with a fleet, and restored to the people their ancient form of government (307 B.C.). Having lost the battle of Ipsus against Seleucus, Cassander, and Lysimachus (301 B.C.), he fled to Ephesus, and passing over to Corinth, embarked on an expedition against the Thracian dominions of Lysimachus. He then went to Asia, to bestow his daughter Stratonice in marriage on Seleucus, and on his way took possession of Cilicia, by which his friendship with Seleucus was broken off. He conquered Macedonia (294 B.C.), and reigned seven years, but lost this country by his arbitrary conduct.

Demetrius II. (called "Nicator"), king of Syria: d. 126 B.C. Ptolemy Philometer, king of Egypt, placed him on the throne of his father, after expelling the usurper, Alexander Balas, 146 B.C. He married Cleopatra, the wife of the same Alexander, and daughter of Ptolemy.

Demetrius, or **Dmitri,** a series of impostors who usurped supreme authority in Russia, and led to some of its remarkable revolutions. Ivan Wasiliewitch, who had put his eldest son to death, left the throne in 1584 to another son, Fedor, whom Boris Godunow entirely supplanted in his authority. Ivan had left another son, Dmitri, by a second marriage; and Boris, fearing that he might one day prove a formidable obstacle to his ambitious projects, made away with him, but no one exactly knew how. Shortly after, in 1598, Fedor died, and Boris took possession of the throne. Mystery still hung over the fate of Dmitri, and Grishka, or Gregory Otrepieff, determined to turn it to account. Several persons had been struck with his resemblance to Dmitri, and he at once explained the fact by declaring that he was Dmitri indeed, and that the design of Boris to murder him had been frustrated. The report quickly spread, and Otrepieff fled into Poland, where Sigismund III., king of Poland, who saw in him a useful instrument for introducing Polish influence into Russia, aided him to enter that kingdom at the head of a body of troops. Boris was deserted by his soldiers, and ended his life by poison. Otrepieff in 1605 entered Moscow in triumph, and, as the genuine son of Ivan, was proclaimed grand duke of Russia. He was now firmly seated on the throne, and might have transmitted it to his descendants had he governed with prudence. Conspirators, after exciting a tumult, forced their way into the palace and put the false Dmitri to death. His body was exposed to public view, but in such a state that its features could not be recognized; and a rumor of his being still alive having spread, another impostor quickly appeared to personify him. The Poles espoused the cause of the second false Dmitri, and had made it triumphant, when he was assassinated in 1610 by the Tartars whom he had selected as his body guards. A state of anarchy ensued, and continued for nearly half a century, during which a number of other false Dmitri appeared in different quarters.

Demetrius Phalereus, fa-lē'rē-ŭs, Greek orator. He was made Macedonian governor of Athens, and archon (309 B.C.), and embellished the city by magnificent edifices. The gratitude of the Athenians, over whom he ruled, erected him as many statues as there are days in the year, but these were afterward scornfully broken, and he himself condemned to death by that fickle people. He fled to Egypt, where he is said to have promoted the establishment of the Alexandrian Library, and of the museum, the superintendence of which Ptolemy Lagus entrusted to him. Under Ptolemy Philadelphus, he fell into disgrace, and was banished to a remote fortress, where he died from the bite of an asp. Demetrius was among the most learned of the Peripatetics, and wrote on several subjects of philosophical and political science. But the work on rhetoric, under his name, belongs to a later age.

Demetz, dė-mäs, **Frédéric Auguste,** French philanthropist and prison reformer: b. Paris 12 May 1796; d. there 22 Nov. 1872. He was judge, vice-president of the chamber of correctional police, and court councilor. He founded in 1840, the penitential and agricultural colony of Mettray for juvenile delinquents, devoting himself wholly to this establishment, which has served as a model in France and elsewhere. He was elected corresponding member of the Academy of Moral and Political Sciences, Paris, in 1864. He wrote many essays and reports upon penitentiary methods and reforms.

Demi Lune (same as ravelin), in fortification, is a work constructed to cover or protect the curtain or wall of a place, and the shoulders of the neighboring bastions. It is composed of two faces forming a salient angle toward the open country outside the place. It has two demi-gorges formed near the counterscarp, and is surrounded by a ditch.

Demi-monde, dĕm'ī-mŏnd, an expression first used by the younger Dumas in a drama of the same name (first performed in 1855), to denote that class of gay female adventurers who differ from honest women in being the objects of public scandal, and from courtesans by their non-venality. When the word is used elsewhere

than in France the last-mentioned difference is seldom kept in mind.

Demi-relief, or **demi-rilievo,** rĕ-lēf', rē-lē'vō, a term applied to sculpture projecting moderately from the face of a wall; half raised, as if cut in two, and half only fixed to the plane. Mezzo-rilievo, which is the more correct term used to designate this style of sculpture, is lower than alto-rilievo and higher than basso-rilievo.

Demidoff, dĕm'ē-dŏf, or **Demidov,** a noble Russian family, whose head, Nilka Demidoff, was an armory-founder at Toula. This Demidoff was intrusted by Peter the Great with the business of casting the cannon for that prince's numerous warlike expeditions. He actively seconded all the exertions of the czar, and in 1725 discovered the mines of Kolyvan, the working of which speedily enriched him. He left a son, Nitika, and several grandsons, who distinguished themselves in the same career as their progenitor, and amassed colossal fortunes. The best known of these are Prokop Demidoff, who worked with great profit the iron, copper, and gold mines of the Ural Mountains; Nikolai Nikitich (about 1773–1828), a zealous philanthropist, who introduced into his country several branches of industry, founded establishments of public utility, and carried to a great state of perfection the working of mines. He had an annual income of more than $1,000,000. His last years he passed in France and Italy, enjoying the society of learned men, and heaping benefits on all around him. He left two sons, Paul and Anatole (1812–70), who, as well as inheriting his fortune, had also the same high taste and benevolence.

Demijohn, a jug in a wickerwork casing or box. The name naturally suggests "half-John," or somebody or something directly or indirectly connected with some "John" and liquor. But demijohns are used for holding all sorts of liquors — not necessarily intoxicants.

The origin of the word is uncertain. We get it from the French "damejeanne," which signifies a "demijohn," just as in our language. And that word appears to have been originally a corruption of "Dame Jeanne," or Lady Jane — or else to have gone into the French tongue directly from the Arabic "damagan" (a demijohn), said to be so called from Damagan, a town in Khorasan, a northern province in Persia, once famous for its glass-works, and to have been the spot where glass jugs enclosed in wickerwork were originally made.

The demijohns themselves are a most important article in the liquor, oil, drug and paint trades, not to mention other branches generally not so well known. The largest demijohn regularly made for the trade has a capacity of five gallons. The smallest holds 1½ ounces, or less than a gill. This size is used chiefly for perfumery and cordials. Between the five-gallon and the gill size demijohns are made in many sizes, including quarts, pints and half-pints. Demijohns are not very costly, but the very smallest are the most expensive proportionately. A gill demijohn sells for more than one that will hold half a gallon, the reason being that the little ones must be covered and finished with great care, while in the larger sizes the chief thing required is serviceability. For the basket work on the smaller demijohns takes more time and costs more for labor than a demijohn some sizes larger. Demijohns are used for many purposes. They are filled with vinegar, molasses, perfumery, bay rum, cordials, extracts, essences and for various waters. Almost all the demijohns used in America are made here, though some are imported from Germany and France. Before sending them to this country they pack their big demijohns in cork scraps, or shredded sponges for their protection and transportation. Our big five-gallon demijohns are made in the form of box-demijohns, the bottle being incased not in wickerwork, but in a box, or a wooden crate. Sometimes smaller ones are made in this way. The big demijohns are known as carboys and are regularly employed to transport chemicals.

De Mille, Henry Churchill, American playwright: b. North Carolina about 1853; d. Pompton, N. J., 10 Feb. 1893. He was graduated at Columbia College, and was by turns preacher and teacher till 1882, when he became examiner of plays at the Madison Square Theatre, and later for a short time an actor. His first successful play was the 'Main Line,' in which he collaborated with Charles Barnard. In 1887, having become associated with David Belasco, he wrote the well-known society dramas: 'The Wife' (1887); 'Lord Chumley' (1888); 'The Charity Ball' (1889); 'Men and Women' (1890). His last work was a melodrama adapted from the German, entitled 'Lost Paradise,' which was successfully produced in 1892.

De Mille, James, Canadian novelist: b. St. John, N. B., Aug. 1837; d. Halifax, N. S., 28 Jan. 1880. Graduated at Brown College in 1854. He was professor of classics in Acadia College (1860–5), and of history and rhetoric in Dalhousie College, Halifax, from 1865 until his death. Among his publications are: 'The Dodge Club' (1866); 'Cord and Creese' (1867); 'A Comedy of Terrors' (1872); 'The Living Link' (1874); and many books for boys, including 'Treasures of the Sea.' A posthumous work, 'A Strange Manuscript Found in a Copper Cylinder,' appeared in 1888. A treatise of his on rhetoric was published in 1878.

Deming, Clarence, American journalist: b. Litchfield, Conn., 1 Oct. 1848. He was graduated at Yale College 1872; was assistant editor of the Troy *Whig,* 1872–3, and served as night editor of the New Haven *Palladium* 1874–5. He was on the staff of the New York *Evening Post* 1874-84, and was afterward for several years editor of the New Haven *News.* He is the author of 'By Ways of Nature and Life.'

Deming, Philander, American lawyer and author: b. Carlisle, N. Y., 6 Feb. 1839. He was graduated at the University of Vermont 1861, and at the Albany Law School. From 1878-9 he was president of the New York State Law Stenographers' Association. He began to write stories for the magazines in 1873, and his published books include 'Adirondack Stories'; 'Tompkins and Other Folks.'

Demise, dẹ-mīz' (literally, a "laying down"), a grant by lease; it is applied to an estate either in fee-simple, or for a term of life or years. The word demise in a lease implies an absolute covenant on the part of the lessor for the lessee's peaceable enjoyment during the term. As applied to the crown of England, demise signifies its transmission to the next heir on being laid down by the sovereign. "So tender

of the law of supposing even a possibility of the sovereign's death, that his natural dissolution is called his demise, an expression which merely signifies a transfer of property" (Blackstone).

Demisemiquaver, in musical notation it is half a semiquaver (sixteenth note), or the thirty second part of a semibreve (whole note). When written as a note or rest it has three little crooks or bars appended to the stem.

Demiurge, dĕm'i-ėrj (Greek, *demiourgos*, "a handicraftsman"), designation applied by Plato and other philosophers to the Divine Being, considered as the Architect or Creator of the universe. The Gnostics made a distinction between the Demiurge and the Supreme Being; with them the first is the Jehovah of the Jews, who, though deserving to be honored as the Creator, was only the instrument of the Most High. He was also called Archon and Son of Chaos, chief of the lowest order of spirits or eons of the Pleroma. He corresponds to the Logos or Word of St. John.

In some of the Peloponnesian states of ancient Greece the name Demiurge seems to have been given to a chief magistrate, probably corresponding to the Roman tribune. The origin of evil was sometimes attributed to the Demiurge.

Democe'des, Greek physician: b. Crotona about 550 B.C.; d. 504 B.C. He was for a time physician to Polycrates, tyrant of Samos; was taken prisoner by the Persians and rose to a position of considerable influence at the court of Darius I. through his medical skill. He persuaded the king to send him with others on a secret mission to Greece, but escaped from his companions and fled to Crotona.

Democracy (Gr. *δημοκρατία* = *δῆμος*, the people, and *κράτος*, power), a form of government in which the people, either directly or through their representatives, are supreme; according to Lincoln's definition, a government of the people, by the people, for the people. A pure democracy was for many centuries the dream of political idealists, because it meant liberty with the full power of self-development to the individual. The Greeks were the first people who tried to realize the democratic ideal. Aristotle enumerates among the three possible forms of government the monarchy, the oligarchy, and the democracy. The monarchy however may be a despotism, like that of Russia; a monarchy, like that of Germany overruling by the power of the army the will of chancellor or prime minister and parliament, and claiming the divine right of kings; or a limited monarchy, like that of England, in the history of which the parliament has more than once proved itself paramount. The oligarchy, the supremacy of a small class, may be based on hereditary rank, or property qualifications. The democracy may be mixed and partial, as when it tolerates the existence of slaves in its territory, as Athens did; or it may degenerate into ochlocracy, mob government, as in the early days of the French republic, whose counsels were swayed alternately by the power of a sort of oligarchical minority, and the stormy and fluctuating passions of the mob. More important is the distinction in a democracy between direct and indirect representation. The Athenian democracy professed to establish direct representation of the demos. In the agora or place of legislative assembly everyone but slaves might speak and vote. Such was the theory, but as a matter of fact only 1 in 40 was qualified to vote out of a population of more than half a million. Nor can it be forgotten that direct representation in the agora, or parliament of Athens, was practically limited to the city of Athens; not even the whole territory of Attica was represented there, much less the Athenian islands and dependencies. Even at Athens, the importance of the masses was never recognized. The main power was aristocratic, and the conflicts of the agora exhibited the people swayed hither and thither by speeches of men like Pericles and Alcibiades, or lashed into fury by plebeian Cleon in his vain attempt to break through the phalanx of aristocratic exclusiveness. The Roman republic was not a democracy in the sense of giving full voice to the will of the people; its republicanism consisted in a hatred for the name of king. The essence of a democracy lies in the abolition of institutions which shall give constitutional permanence to class distinctions. In the light of this principle it will plainly be seen that the mediæval communes or republics of Italy fell very far short of being democratic in their character. Here we may point out how much confusion there exists in men's minds in distinguishing between political and social democracy, between the democracy of laws and the democracy of sentiment and manners. The principle of the legal and political equality of men is not inconsistent with the utmost variety of natural and social distinctions. It only forbids the creation by law of artificial distinctions. The example of the American people shows that democratic political institutions are compatible with very great inequalities in cultivation, manners, style of living, social consideration and the distribution of property.

Modern democracy, as we now see it, is the result of a gradual process of development continued through centuries amidst the severest struggles. Such struggle will appear to be inevitable, when we consider that democracies have grown up in large states in which absolutism formerly prevailed, and in which the military system prevails even yet. Among the decisive steps in the modern struggle of the people against the old classes and systems should be noted the long contest of the Dutch against Spain, the great English revolutions of 1642 and 1688, the war of American Independence in 1776, the great French Revolution of 1789, and the revolutionary periods of 1830 and 1848. The English revolutions of 1642 and 1688 established parliamentary rule in England, though on a narrow basis. Yet they had the important result of proving the fitness of a new type of government, which further became a model for similar institutions in other countries. The greatest event in the evolution of democracy, however, was the French Revolution of 1789; though it failed for the time, it shook the old system to its foundations; it everywhere spread new ideas, and raised questions that could not again be set aside. The revolution of 1830 showed that the reactionary conditions prevalent after Waterloo had no claim to permanency. The revolutionary movements of 1848, which affected France, Italy, Austria and Germany, were apparently a failure, yet they overthrew what remained of the feudal system in western and central Europe. But the most significant thing connected with that period is the fact that

only a few years afterward universal suffrage was introduced in all the countries where its influence had been felt. Governments which had been most active in suppressing the revolution found it expedient to adopt its cardinal principles. The fundamental basis of democracy is the recognition of the rights of man as man. Its central principle is the equality of all men before the law, without regard to birth, property, or social rank; from which principle is deduced the right of all men to an equal voice or vote in deciding upon public affairs, or in selecting agents and representatives to perform the functions of legislation and to execute the laws. The principles of democracy are forcibly and clearly stated in the American Declaration of Independence, in the words of Thomas Jefferson, who has been called "the apostle of democracy": "We hold these truths to be self-evident; that all men are created equal; that they are endowed by their Creator with certain inalienable rights; that among these are life, liberty, and the pursuit of happiness. That, to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed." These principles are still more fully developed in the constitutions of the States of the Union. The constitution of New Hampshire (1792) says: "All men are born equally free and independent; therefore all government of right originates from the people. All power residing originally in and being derived from the people, all the magistrates and officers of the government are their substitutes and agents, and at all times accountable to them." These principles are enunciated with equal clearness in the Constitutions of other States of the Union. It is as representing these principles that the government of the United States, as also of the several States that constitute the Union, is democratic in fullest sense of the term.

As we have seen, the distinctive features of the modern democracy are the widest personal freedom, by which each man has the liberty and responsibility of shaping his own career; equality before the law; and political power in the form of universal suffrage, exercised through the representative system. With these are associated universal education, and on the continent of Europe universal liability to military service. In Great Britain and the United States universal liability to military service exists also in theory as regards the militia. On the European continent it is a momentous fact imposed upon its peoples by the necessities of the struggle for existence, which the moral development of mankind has not yet been able so to regulate as to put an end to war. Anglo-Saxon countries are happily freer from such necessities. It is an interesting fact, however, that Prussia, which was the first great nation to adopt universal education, was also the first to introduce universal military service.

It is important to remember that the growth of the modern democracy has gone hand in hand with the general development of the most advanced nations of the world. The consolidation of the political power of the people is the result of far-reaching causes operating on a great scale throughout the history of modern nations. The growth of the democracy is intimately connected with the growth of every other factor in the social life. For example, the different stages in the rise of the democracy could be paralleled by the improvements in the art of printing. The development of the democracy has on the one hand created the demand for cheap literature and cheap newspapers, but it has also on the other hand depended on the supply of them. Further, the growth of the cheap newspaper and of cheap literature depends on the industrial development, on the improvement of our technical capacities and resources, on man's growing mastery over nature. To the production of the daily newspaper a thousand technical appliances are subsidiary. Steam and electricity are the great forces that move the vast mechanism on which society is now based. In fact the growth of the democracy is intimately connected with an industrial and technical development which has culminated in the railway, the penny post, the electric telegraph, and the steam printing-press. The peculiar influence of the human voice has not been superseded, yet it is chiefly through the telegraph and the printing-press that the modern democracy obtains the education which the ancient democracy received in their popular assemblies and in the daily intercourse of the market-place.

Democratic Party, The, one of the chief political organizations in the United States. To Thomas Jefferson belongs the honor of being the founder, and for a third of a century the undisputed leader, of the Democratic party. Scarcely had the present Constitution been adopted before there appeared a line more or less distinct dividing those who, like Jefferson (q.v.), believed the people fully capable of self-government and trusted them, and those who, like Hamilton (q.v.), thought that the masses needed to be under the control of a strong and centralized government. This fundamental difference of opinion manifested itself in the treatment of every important question, and party organizations were soon perfected.

As Jefferson himself has described the birth of parties in the United States, his opinion can be accepted as authoritative. In a letter written in June 1823, near the close of his life, to William Johnson, he said:

> At the formation of our government, many had formed their political opinions on European writings and practices, believing the experience of old countries, and especially of England abusive as it was, to be a safer guide than mere theory. The doctrines of Europe were that men in numerous associations cannot be restrained within the limits of order and justice, but by forces physical and moral, wielded over them by authorities independent of their will. Hence their organization of kings, hereditary nobles, and priests. Still further to constrain the brute force of the people, they deem it necessary to keep them down by hard labor, poverty and ignorance, and to take from them as from bees, so much of their earnings, as that unremitting labor shall be necessary to obtain a sufficient surplus barely to sustain a scanty and miserable life. And these earnings they apply to maintain their privileged orders in splendor and idleness, to fascinate the eyes of the people, and excite in them an humble adoration and submission, as to an order of superior beings. Although few among us had gone all these lengths of opinion, yet many had advanced, some more, some less, on the way. And in the convention which formed our government, they endeavored to draw the cords of power as tight as they could obtain them, to lessen the dependence of the general functionaries on their constituents, to subject to them those of the States, and to weaken their means of maintaining the steady equilibrium which the majority of the convention had deemed salutary for both branches, general and local. To recover, therefore, in practice the powers which the nation had refused and to warp to their own wishes those actually given, was the steady object of the Federal party.

Ours, on the contrary, was to maintain the will of the majority of the convention and of the people themselves. We believed, with them, that man was a rational animal endowed by nature with rights and with an innate sense of justice, and that he could be restrained from wrong and protected in right, by moderate powers confided to persons of his own choice, and held to their duties by dependence on his own will. We believe that the complicated organization of kings, nobles, and priests, was not the wisest nor best to effect the happiness of associated man; that wisdom and virtue were not hereditary; that the trappings of such a machinery, consumed by their expense, those earnings of industry they were meant to protect, and, by the inequalities they produced, exposed liberty to sufferance. We believe that men, enjoying in ease and security the full fruits of their own industry, enlisted by all their interests on the side of law and order habituated to think of themselves and to follow their reason as their guide, would be more easily and safely governed, than with minds nourished in error and vitiated and debased, as in Europe, by ignorance indigence, and oppression. The cherishment of the people then was our principle, the fear and distrust of them that of the other party. Composed, as we were, of the landed and laboring interests of the country, we could not be less anxious for a government of law and order than were the inhabitants of the cities, the strongholds of federalism. And whether our efforts to save the principles and form of our Constitution have not been salutary, let the present republican freedom, order, and prosperity of our country determine.

Jefferson not only gave a history of the formation of parties, but fortunately for later generations, he enumerated the elements which each party contained. In a letter to C. E. Ebeling in 1795 he said:

Two parties exist within the United States. They embrace respectively the following descriptions of persons. The Anti-Republicans consist of: (1) The old refugees and Tories; (2) British merchants residing among us, and composing the main body of our merchants; (3) American merchants trading on British capital, another great portion; (4) speculators and holders in the banks and public funds; (5) officers of the Federal government with some exceptions; (6) office hunters willing to give up principles for places,—a numerous and noisy tribe; (7) nervous persons, whose languid fibres have more analogy with a passive than active state of things. The Republican party of our Union comprehends: (1) The entire body of landholders throughout the United States; (2) the body of laborers not being landholders whether in husbanding or the arts. The latter is to the aggregate of the former party probably as 500 to 1; but their wealth is not as disproportionate, though it is also greatly superior and is in truth the foundation of that of their antagonists. Trifling as are the numbers of the Anti-Republican party, there are circumstances which give them an appearance of strength and numbers. They all live in cities together, and can act in a body and readily at all times; they give chief employment to the newspapers, and, therefore, have most of them under their command. The agricultural interests are dispersed over a great extent of country, have little means of intercommunication with each other, and feeling their own strength and will, are conscious that a single exertion of these will at any time crush the machinations against their government.

Jefferson's philosophical mind sought not only the facts, but the reason for the facts, and in 1824, in a letter to Mr. Lee he thus classified men according to their party tendencies:

Men by their constitutions are naturally divided into two parties: (1) Those who fear and distrust the people and wish to draw all powers from them into the hands of the higher classes; (2) those who identify themselves with the people, have confidence in them, cherish and consider them as the most wise depositary of the public interests. In every country these two parties exist, and in every one where they are free to think, speak, and write, they will declare themselves. Call them, therefore, liberals and serviles, Jacobins and ultras, Whigs and Tories, Republicans and Federalists, aristocrats and Democrats, or by whatever name you please, they are the same parties still, and pursue the same object. The last appellation of aristocrats and Democrats is the true one expressing the essence of all.

Jefferson's purpose was to found a party that would be really democratic in personnel, in purpose and in method. The party, however, was at first called the Republican party, and afterward the Democratic-Republican party. It was not until in Jackson's time that it became universally known by its present name. As there were no national conventions and no national platforms in the early days of the Republic the position of the party on public questions must be gathered from the words and speeches of the leaders and from the votes of the members of the party in Congress. Jefferson's first inaugural address contained the essence of the party creed as generally accepted during the first quarter of the 19th century. In fact, it is still the creed of the party, and no group of men desiring to maintain an influence in the party can even now admit any essential departure from it. It will be found below:

About to enter, fellow-citizens, on the exercise of duties which comprehend everything dear and valuable to you, it is proper you should understand what I deem the essential principles of our government, and consequently those which ought to shape its administration. I will compress them within the narrowest compass they will bear, stating the general principle, but not all its limitations. Equal and exact justice to all men, of whatever State or persuasion, religious or political; peace, commerce, and honest friendship with all nations, entangling alliances with none; the support of the State governments in all their rights, as the most competent administrations for our domestic concerns and the surest bulwarks against Anti-Republican tendencies; the preservation of the general government in its whole constitutional vigor, as the sheet anchor of our peace at home and safety abroad; a jealous care of the right of election by the people — a mild and safe corrective of abuses which are lopped by the sword of revolution where peaceable remedies are unprovided; absolute acquiescence in the decisions of the majority, the vital principle of republics, from which is no appeal but to force, the vital principle and immediate parent of despotism; a well-disciplined militia, our best reliance in peace and for the first moments of war, till regulars may relieve them; the supremacy of the civil over the military authority; economy in the public expense that labor may be lightly burthened; the honest payment of our debts and sacred preservation of the public faith; encouragement of agriculture, and of commerce as its handmaid; the diffusion of information and arraignment of all abuses at the bar of the public reason; freedom of religion, freedom of the press, and freedom of person under the protection of the *habeas corpus*, and trial by juries impartially selected. These principles form the bright constellation which has gone before us and guided our steps through an age of revolution and reformation. The wisdom of our sages and blood of our heroes have been devoted to their attainment. They should be the creed of our political faith, the text of civic instruction, the touchstone by which to try the services of those we trust; and should we wander from them in moments of error or of alarm, let us hasten to retrace our steps and to regain the road which alone leads to peace, liberty, and safety.

The first and most fundamental difference between the Democratic party (when it was known as the Republican party, afterward as the Democratic-Republican party, and to-day as the Democratic party) and the party which has opposed it (first known as the Federal party, then as the Whig party and more recently as the Republican party), was upon the construction of the Constitution. The former party has insisted upon a strict construction, while the latter

has leaned toward a liberal construction of the Federal constitution. This difference is a natural one for the Democratic party, believing in the right of the people to, and in the capacity of the people for, self-government, has insisted upon giving them as large a part as possible in the control of their own affairs.

It follows, therefore, that the Democratic party favors local self-government and opposes the centralization of power in remote centres. It believes that the nearer the people are to their government the more effective will be their control over it. The various parties that have opposed the Democratic party have given more or less emphasis to the Hamiltonian view and have increased the power of the representative at the expense of the constituents.

While this distinction has not at all times been clearly marked, and while these views have not been held by all the individual members, the general tendency has existed.

In the very beginning this tendency was illustrated in the Alien and Sedition laws, enacted by the Federalists and in the Kentucky and Virginia resolutions supported by the Democrats. (See ALIEN AND SEDITION ACTS, also Kentucky resolutions and Virginia resolutions.) Both parties in this instance went to the extreme, the Federalists attempting to confer dangerous power upon the Federal government, the Democrats asserting views which were afterward so misconstrued as to weaken the Federal Union. The preservation of the balance between the Federal government and the State governments has always been a delicate matter, and as the line cannot be drawn with mathematical accuracy there has always been room for dispute; the public sentiment having gone to the one side or the other as it was necessary to maintain the equilibrium. It is likely that this discussion will continue, but the efforts to carry the government to an extreme in either direction will be thwarted by the conservative middle class, which rallies to the support of the side that is attacked.

Beginning with Jefferson's administration in 1801, and continuing to the end of Monroe's administration in 1825, the Democratic party held undisputed sway in the nation. Jefferson, like Washington, refused to consider a third term, and his secretary of state, James Madison (q.v.), succeeded him. Madison, following the example set by his predecessor, retired at the end of his second term, and James Monroe (q.v.), who had been his secretary of state, succeeded him.

The War of 1812 was conducted by the Madison administration, and it was during this period that the Hartford resolutions were adopted by a convention of Federalists which met at Hartford, Conn., in December 1814. These resolutions went further in the direction of States rights than either the Kentucky resolutions or the Virginia resolutions. They began by recommending "to the legislatures of the several States represented in this convention, to adopt all such measures as may be necessary effectually to protect the citizens of said States from the operation and effects of all acts which have been or may be passed by the Congress of the United States, which shall contain provisions subjecting the militia or other citizens to forcible drafts, conscriptions, or impressments not authorized by the Constitution of the United States."

While the Hartford resolutions announced a political policy, they had their origin in the commercial interests which were affected by the War of 1812, and by the embargo act (see EMBARGO) which was enacted as a war measure.

The Federal party which supported Clinton's candidacy in 1812 laid great stress upon the commercial interests. The platform adopted by the New York Federalists urged the election of Clinton as the surest method of guaranteeing the protection of those commercial interests which were flagging "under the weakness and imbecility of the administration." The Federalists attacked what they called the Virginia regency, and the Hartford resolutions recommended a constitutional amendment making the President ineligible for renomination, and another prohibiting the selection of two Presidents in succession from the same State.

It was during the administration of James Monroe that the doctrine, afterward known by his name, and followed ever since, was promulgated. The doctrine was set forth in a message sent to Congress by James Monroe on 2 Dec. 1823. (See MONROE DOCTRINE.) The following is the text covering this subject:

> In the wars of European powers, in matters relating to themselves, we have never taken any part, nor does it comport with our policy so to do. It is only when our rights are invaded or seriously menaced that we resent injuries or make preparations for our defense. With the movements on this hemisphere we are, of necessity, more immediately connected, and by causes which must be obvious to all enlightened and impartial observers. The political system of the allied powers (the Holy Alliance) is essentially different in this respect from that of America. This difference proceeds from that which exists in their respective governments. And to the defense of our own, which has been achieved by the loss of so much blood and treasure, and matured by the wisdom of their most enlightened citizens and under which we have enjoyed unexampled felicity, this whole nation is devoted. We owe it, therefore, to candor and to the amicable relations existing between the United States and those powers to declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies or dependencies of any European power we have not interfered, and shall not interfere. But with the governments who have declared their independence and maintained it we have on great consideration and on just principles, acknowledged we could not view any interposition for the purpose of oppressing them, or controlling in any other manner their destiny, by any European power, in any other light than as the manifestation of an unfriendly disposition toward the United States. Our policy in regard to Europe, which was adopted at an early stage of the wars which have so long agitated that quarter of the globe, nevertheless remains the same, which is not to interfere in the internal concerns of any of its powers; to consider the government de facto as the legitimate government for us; to cultivate friendly relations with it, and to preserve those relations by a frank, firm, and manly policy; meeting in all instances the just claims of every power, submitting to injuries from none. But in regard to those continents, circumstances are eminently and conspicuously different. It is impossible that the allied powers should extend their political system to any portion of either continent without endangering our peace and happiness; nor can any one believe that our southern brethren, if left to themselves, would adopt it of their own accord. It is equally impossible, therefore, that we should behold such interposition, in any form, with indifference.

This message was written after consultation with Jefferson, who was then living in retire-

ment at Monticello. The following extract from a letter written by Jefferson to Monroe in October 1823, not only shows Jefferson's part in the formulation of the doctrine, but also proves his foresight and his comprehension of American interests, and his devotion to the welfare of his country:

The question presented by the letters you have sent me, is the most momentous which has been offered to my contemplation since that of Independence. That made us a nation, this sets our compass and points the course which we are to steer through the ocean of time opening on us. And never could we embark on it under circumstances more auspicious. Our first and fundamental maxim should be, never to entangle ourselves in the broils of Europe. Our second, never to suffer Europe to intermeddle with cis-Atlantic affairs. America, North and South, has a set of interests distinct from those of Europe and peculiarly her own. She should, therefore, have a system of her own, separate and apart from that of Europe. While the last is laboring to become the domicile of despotism, our endeavor should surely be to make our hemisphere that of freedom. One nation most of all, could disturb us in this pursuit; she now offers to lead, aid, and accompany us in it. By acceding to her proposition, we detach her from the bands, bring her mighty weight into the scale of free government, and emancipate a continent at one stroke, which might otherwise linger long in doubt and difficulty. Great Britain is the nation which can do us the most harm of any one, or all on earth; and with her on our side we need not fear the whole world. With her, then, we should most sedulously cherish a cordial friendship; and nothing would tend more to knit our affections than to be fighting once more side by side in the same cause. Not that I would purchase even her amity at the price of taking part in her wars. But the war in which the present proposition might engage us, should that be its consequence, is not her war, but ours. Its object is to introduce and establish the American system, of keeping out of our land all foreign powers, of never permitting those of Europe to intermeddle with the affairs of our nations. It is to maintain our own principle, not to depart from it. And if to facilitate this, we can effect a division in the body of the European powers, and draw over to our side its most powerful member, surely we should do it. But I am clearly of Mr. Canning's opinion, that it will prevent instead of provoke war. With Great Britain withdrawn from their scale and shifted into that of our two continents, all Europe combined would not undertake such a war. For how would they propose to get at either enemy without superior fleets? Nor is the occasion to be slighted which this proposition offers, of declaring our protest against the atrocious violations of the rights of nations by the interference of any one in the internal affairs of another, so flagitiously begun by Bonaparte, and now continued by the equally lawless Alliance calling itself Holy. But we have first to ask ourselves a question. Do we wish to acquire to our own confederacy any one or more of the Spanish provinces? I candidly confess that I have ever looked on Cuba as the most interesting addition which could ever be made to our system of States. The control which, with Florida Point, this island would give us over the Gulf of Mexico, and the countries and isthmus bordering on it, as well as all those whose waters flow into it, would fill up the measure of our political well-being. Yet, I am sensible that this can never be obtained, even with her own consent, but by war; and as its independence, which is our second interest (and especially its independence of England), can be secured without it, I have no hesitation in abandoning my first wish to future chances and accepting its independence, with peace and the friendship of England, rather than its association, at the expense of war and her enmity. I could honestly, therefore, join in the declaration proposed, that we aim not at the acquisition of any of those possessions, that we will not stand in the way of any amicable arrangement between them and the mother country; but that we will oppose, with all our means, the forcible interposition of any other power, as auxiliary, stipendiary, or under any other form or pretext, and most especially, their transfer to any power by conquest, cession, or acquisition in any other way.

Jefferson died on 4 July 1824, just 50 years after the signing of the Declaration of Independence. The year that marked his demise marked the entrance of the second great Democratic leader into the arena of politics.

Andrew Jackson (q.v.) of Tennessee, the hero of the War of 1812, had grown in fame and popularity from the day of his victory over the English at New Orleans. In 1824 he became the nominee of his party, and in the election following received 155,872 votes, as against 105,321 cast for John Quincy Adams; 44,282 cast for Crawford; and 46,587 cast for Henry Clay. In the Electoral College, Jackson received 99 votes, Adams 84, Crawford 41, and Clay 37. As no one of the candidates had a majority in the Electoral College the election of the President devolved upon the House of Representatives; and by a coalition between the friends of Adams and the friends of Clay, the former received the votes of 13 States, while Jackson received but 7 and Crawford 4.

The defeat of Jackson after he had secured a large plurality of the popular vote, and a considerable plurality in the Electoral College, aroused great partisan feeling, and from that time until 1828, Jackson was the candidate of the party, his campaign growing in strength as the years proceeded until when election day arrived he had a popular majority of nearly 140,000, and a majority of nearly 100 in the Electoral College. Calhoun was chosen Vice-President at the same time.

The chief features of Jackson's administration were his treatment of the nullification act of the South Carolina legislature, and his veto of the act for the rechartering of the United States bank. He took vigorous steps to enforce the Federal authority and, in an elaborate message, presented the arguments against the right of secession with a force and clearness never since surpassed. His action in this matter resulted in the alienation of John C. Calhoun, who up to that time had been a staunch political friend.

The fight over the bank charter not only occupied a large part of the time of his administration, but resulted in a controversy that permeated other issues. The Senate passed a resolution censuring him for removing the deposits from the bank, and this became an issue. Under the leadership of Thomas H. Benton, of Missouri, the Democrats began a fight for the reversal of the action of the Senate, and finally secured a majority of that body and expunged the resolution.

While Jackson's military achievements were the foundation for his early popularity, his great political fame was due to championing the cause of the masses, as against the concentrated power of wealth. In his message vetoing the bank charter he presented with emphasis and accuracy the Democratic view of the sphere of government. He said:

Distinctions in society will always exist under every just government. Equality of talents, of education, or of wealth, cannot be produced by human institutions. In the full enjoyment of the gifts of heaven and the fruits of superior industry, economy, and virtue every man is equally entitled to protection by law. But when the laws undertake to add to those natural and just advantages artificial distinctions — to grant titles, gratuities, and exclusive privileges — to make the rich richer and the potent more powerful — the humble members of society — the farmers, mechanics, and the laborers — who have neither the time nor the means of securing like favors for themselves,

have a right to complain of the injustice of their government.

Jackson's position on the bank charter represented the views of his party adherents. His veto was sent to Congress on 10 July 1831, and it was the main issue of the campaign of 1832, when with Henry Clay as his opponent he secured a popular plurality of 157,000. In the Electoral College he had 219 votes as against 49 cast for Clay. His secretary of state, Martin Van Buren, succeeded him as the Democratic candidate, and was elected, having both a popular majority and a majority in the Electoral College. Van Buren defeated William Henry Harrison in that year, and was defeated by him in the following campaign. In the earlier campaigns the nominations were made by a Congressional caucus, or by the various States, but Jackson's renomination in 1832 was made by a national convention held at Baltimore, and Van Buren was nominated by a convention held at the same place four years later.

In 1840 the Democratic convention was again held at Baltimore, Van Buren was renominated and a lengthy platform was adopted. As this platform was the basis of all platforms adopted from that time to the breaking out of the Civil War it is worthy of reproduction. It was as follows:

1. Resolved, That the Federal government is one of limited powers, derived solely from the Constitution, and the grants of powers shown therein ought to be strictly construed by all the departments and agents of the government, and that it is inexpedient and dangerous to exercise doubtful constitutional powers.

2. Resolved, That the Constitution does not confer upon the general government the power to commence and carry on a general system of internal improvements.

3. Resolved, That the Constitution does not confer authority upon the Federal government directly or indirectly, to assume the debts of the several States, contracted for local internal improvements or other State purposes; nor would such assumption be just or expedient.

4. Resolved, That justice and sound policy forbid the Federal government to foster one branch of industry to the detriment of another, or to cherish the interests of one portion to the injury of another portion of our common country — that every citizen and every section of the country has a right to demand and insist upon an equality of rights and privileges, and to complete and ample protection of persons and property from domestic violence or foreign aggression.

5. Resolved, That it is the duty of every branch of the government to enforce and practice the most rigid economy in conducting our public affairs, and that no more revenue ought to be raised than is required to defray the necessary expenses of the government.

6. Resolved, That Congress has no power to charter a United States bank; that we believe such an institution one of deadly hostility to the best interests of the country, dangerous to our Republican institutions, and the liberties of the people, and calculated to place the business of the country within the control of a concentrated money power and above the laws and the will of the people.

7. Resolved, That Congress has no power under the Constitution to interfere with or control the domestic institutions of the several States; and that such States are the sole and proper judges of everything pertaining to their own affairs, not prohibited by the Constitution; that all efforts by Abolitionists or others, made to induce Congress to interfere with questions of slavery or to take incipient steps in relation thereto, are calculated to lead to the most alarming and dangerous consequences, and that all such efforts have an inevitable tendency to diminish the happiness of the people, and endanger the stability and permanence of the Union, and ought not to be countenanced by any friend to our political institutions.

8. Resolved, That the separation of the moneys of the government from banking institutions is indispensable for the safety of the funds of the government and the rights of the people.

9. Resolved, That the liberal principles embodied by Jefferson in the Declaration of Independence, and sanctioned in the Constitution, which make ours the land of liberty and the asylum of the oppressed of every nation, have ever been cardinal principles in the Democratic faith; and every attempt to abridge the present privilege of becoming citizens, and the owners of soil among us ought to be resisted with the same spirit which swept the Alien and Sedition laws from our statute book.

As the names of several different persons had been presented for Vice-President the convention of 1840 made no nominations for that office, but adopted resolutions leaving the decision to members of the party in the various States, and trusting that "before the election took place the opinion would be so concentrated as to enable the Electoral College to secure the choice of a Vice-President."

Upon the death of Harrison, John Tyler became President, and during his term vetoed two bills, which had for their object the re-establishing of the United States bank. Tyler favored the annexation of Texas, which had separated from Mexico and had existed under an independent government since 1836. Jas. K. Polk, the Democratic candidate, also favored annexation, while Henry Clay, for a third time a candidate for the Presidency, opposed annexation.

In the platform of 1844, the first nine resolutions of the platform of 1840 were reaffirmed, and new resolutions added demanding, first, that the proceeds of public lands be sacredly applied to the national object specified in the Constitution, rather than distributed among the States; second, sustaining and defending the veto of the President which had "thrice saved the Americans from the corrupt and tyrannical domination of the Bank of the United States," and third, declaring for the annexation of Texas. The campaign resulted in the election of Polk and Dallas, although their majority in the Electoral College was proportionately larger than their popular plurality.

The campaign of 1848 was waged with Lewis Cass of Michigan and William O. Butler of Kentucky as the Democratic candidates for President and Vice-President. The platform of 1848 reaffirmed that of 1840 and 1844, and added new planks covering new questions. Resolution No. 19 of the platform of 1848 is given below because it reiterates the Democratic contention in regard to the value of self-government. It reads:

Resolved, That in view of the recent development of this grand political truth, of the sovereignty of the people and their capacity and power for self-government, which is prostrating thrones and erecting republics on the ruins of despotism in the Old World, we feel that a high and sacred duty is devolved, with increased responsibility, upon the Democratic party of this country, as the party of the people, to sustain and advance among us constitutional liberty, equality, and fraternity, by continuing to resist all monopolies and exclusive legislation for the benefit of the few at the expense of the many, and by a vigilant and constant adherence to those principles and compromises of the Constitution, which are broad enough and strong enough to embrace and uphold the Union as it was, the Union as it is, and the Union as it shall be, in the full expansion of the energies and capacity of this great and progressive people.

The Whig candidates, however, Zachary Taylor and Millard Fillmore, were successful that year, having both a popular majority and a majority in the Electoral College. In the campaign of 1852, Franklin Pierce of New Hampshire and William R. King of Alabama were the Democratic nominees, and the platform reiterated the leading planks of 1840, 1844 and 1848.

The platform of 1852 also reiterated the principles laid down in the Kentucky and Virginia resolutions, and defended the Mexican war "as just and necessary." The campaign of 1852 resulted in an overwhelming Democratic victory, the popular plurality being more than 200,000.

The slavery question was constantly growing in prominence, and at last exerted an influence upon every issue that arose. The position taken by the various parties in regard to the Mexican war was largely determined by the slavery views held by the members of the parties.

The Fugitive Slave laws of the various States also came up for consideration, and each election showed an increase in the anti-slavery sentiment. In 1856 the Democratic platform again reaffirmed the principles set forth in 1840, and reiterated in subsequent campaigns. It quoted resolution 7 of the platform of 1840, and said:

> That the foregoing proposition covers, and was intended to embrace, the whole subject of slavery agitation in Congress; and, therefore, the Democratic party of the Union, standing on this national platform, will abide by, and adhere to, a faithful execution of the acts known as the compromise measures settled by the Congress of 1850, "the act for reclaiming fugitives from service labor" included; which act, being designed to carry out an express provision of the Constitution, cannot, with fidelity thereto, be repealed, or so changed as to destroy or impair its efficiency; that the Democratic party will resist all attempts at renewing in Congress, or out of it, the agitation of the slavery question, under whatever shape or color the attempt may be made.

The Republican party took the name by which the Democratic party was originally known, and it held its first national convention in 1856, John C. Fremont and William L. Dayton being the nominees. James Buchanan and John C. Breckinridge were the Democratic nominees. They received a majority of 60 in the Electoral College and a popular plurality of about 500,000. The American party, led by Millard Fillmore and Andrew J. Donelson, secured only 8 electors but polled 874,000 votes. During the Buchanan administration the Dred Scott decision was rendered, and this, while it was a legal victory for the friends of slavery, resulted in an anti-slavery agitation that inured to the advantage of the Republican party.

In 1860 the conflict between the northern and southern Democrats became irreconcilable, and the Charlestown convention, which met 23 April, having failed to harmonize the differences, adjourned without a nomination. The northern Democrats met at Baltimore 18 June and nominated Stephen A. Douglas of Illinois for President and Herschel V. Johnson of Georgia for Vice President, while the southern wing of the party met at the same place 10 days later, and nominated John C. Breckinridge of Kentucky for President and Joseph Lane of Oregon for Vice-President. As the Douglas platforms adopted at that time represented the positions taken by the two wings of the party they will be found below:

1. Resolved, That we, the Democracy of the Union in convention assembled, hereby declare our affirmance of the resolutions unanimously adopted and declared as a platform of principles by the Democratic convention at Cincinnati, in the year 1856, believing that Democratic principles are unchangeable in their nature when applied to the same subject matters; and we recommend, as the only further resolutions, the following:

Inasmuch as differences of opinion exist in the Democratic party as to the nature and extent of the powers of a Territorial legislature, and as to the powers and duties of Congress, under the Constitution of the United States, over the institution of slavery within the Territories.

2. Resolved, That the Democratic party will abide by the decisions of the Supreme Court of the United States on the question of constitutional law.

3. Resolved, That it is the duty of the United States to afford ample and complete protection to all its citizens whether at home or abroad, and whether native or foreign.

4. Resolved, That one of the necessities of the age, in a military, commercial, and postal point of view, is speedy communication between the Atlantic and Pacific States; and the Democratic party pledge such constitutional government aid as will insure the construction of a railroad to the Pacific coast at the earliest practicable period.

5. Resolved, That the Democratic party are in favor of the acquisition of the island of Cuba, on such terms as shall be honorable to ourselves and just to Spain.

6. Resolved, That the enactments of State legislatures to defeat the faithful execution of the Fugitive Slave Law are hostile in character, subversive of the Constitution, and revolutionary in their effect.

7. Resolved, That it is in accordance with the true interpretation of the Cincinnati platform, that, during the existence of the Territorial governments, the measure of restriction, whatever it may be, imposed by the Federal Constitution on the power of the Territorial legislature over the subject of domestic relations, as the same has been or shall hereafter be finally determined by the Supreme Court of the United States, shall be respected by all good citizens, and enforced with promptness and fidelity by every branch of the general government.

The "Breckinridge platform" was as follows:

Resolved, That the platform adopted by the Democratic party at Cincinnati be affirmed, with the following explanatory resolutions:

1. That the government of a Territory, organized by an act of Congress is provisional and temporary; and, during its existence, all citizens of the United States have an equal right to settle, with their property in the Territory, without their rights, either of person or property, being destroyed or impaired by congressional or territorial legislation.

2. That it is the duty of the Federal government, in all its departments, to protect when necessary, the rights of persons and property in the Territories, and wherever else its constitutional authority extends.

3. That when the settlers in a Territory having an adequate population, form a State Constitution in pursuance of law, the right of sovereignty commences, and, being consummated by admission into the Union, they stand on an equal footing with the people of the other States, and the State thus organized ought to be admitted into the Federal Union, whether its Constitution prohibits or recognizes the institution of slavery.

4. That the Democratic party are in favor of the acquisition of the island of Cuba, on such terms as shall be honorable to ourselves, and just to Spain, at the earliest practicable moment.

5. That the enactments of State legislatures to defeat the faithful execution of the Fugitive Slave law are hostile in character, subversive of the Constitution and revolutionary in their effect.

6. That the Democracy of the United States recognize it as the imperative duty of this government to protect the naturalized citizens in all their rights, whether at home or in foreign lands, to the same extent as its native-born citizens.

Whereas, One of the greatest necessities of the age, in a political, commercial, postal, and military point of view, is a speedy communication between the Pacific and Atlantic coasts; therefore be it

Resolved, That the Democratic party do hereby pledge themselves to use every means in their power to secure the passage of some bill to the extent of the constitutional authority of Congress, for the construction of a Pacific railroad, from the Mississippi River to the Pacific Ocean, at the earliest practicable moment.

It will be seen that both conventions reaffirmed the Cincinnati platform of 1856. It will also be noticed that the only difference between the platforms grew out of the slavery question, the Douglas platform leaving the question to the Supreme Court, promising to abide by its decision; the Breckinridge platform declaring that the people of a territory had the right to decide the slavery question for themselves, and also declaring that the citizens of the various States had the right to settle in a territory and carry their property with them (meaning slaves) without being interfered with by congressional action.

The election of 1860 resulted in a victory for the Republican party, whose candidates, Abraham Lincoln and Hannibal Hamlin, ran upon a platform denouncing "threats of disunion," and saying that "the new dogma, that the Constitution, of its own force, carries slavery into any or all of the Territories of the United States," was a "dangerous political heresy." The platform did not call for the abolition of slavery in the States where it existed, but asserted "that the normal condition of all the territory of the United States is that of freedom; that as our Republican fathers, when they had abolished slavery in all our national territory, ordained that 'no person shall be deprived of life, liberty or property, without due process of law,' it becomes our duty by legislation, whenever such legislation is necessary, to maintain this provision of the Constitution against all attempts to violate it; and we deny the authority of Congress, of a territorial legislature, or any individuals, to give legal existence to slavery in any Territory of the United States."

Lincoln received a popular plurality of nearly 500,000, and a plurality of 108 in the Electoral College. Douglas came second in the popular vote, but fell behind both the Breckinridge ticket and Bell and Everett ticket in the Electoral College. This was due to the fact that the Douglas vote was large in the States which Lincoln carried.

In the war between the States the supporters of Douglas enlisted side by side with the supporters of Lincoln, Douglas himself having urged the support of Lincoln in the war for the maintenance of the Union. During the War, however, many things were done which aroused criticism from the Democratic leaders, and by the Democrats generally. Among the things complained of were arrests and courts-martial in States not in insurrection, and where the civil authority was undisturbed.

The Democratic platform of 1864 announced "unswerving fidelity to the Union under the Constitution, as the only solid foundation of our strength, security and happiness as a people, and as a framework of government equally conducive to the welfare and prosperity of all the States, both Northern and Southern"; and then declared

as the sense of the American people, that after four years of failure to restore the Union by the experiment of war, during which, under the pretense of a military necessity of a war power higher than the Constitution, the Constitution itself has been disregarded in every part and public liberty and private right alike trodden down, and the material prosperity of the country essentially impaired, justice, humanity, liberty, and the public welfare demand that immediate efforts be made for a cessation of hostilities, with a view to an ultimate convention of all the States, or other peaceable means, to the end that, at the earliest practicable moment, peace may be restored on the basis of the Federal union of all the States.

Gen. George B. McClellan of New Jersey was nominated by the Democratic party for President and George H. Pendleton of Ohio for Vice-President. The election resulted in a popular majority of 408,000 for the Republican ticket, and in an electoral majority of 191 — Kentucky, New Jersey and Delaware being the only three of the 24 States giving their electoral vote to the Democratic ticket. It will be seen that the Republican plurality was less than it was in 1860.

The assassination of Abraham Lincoln and the inauguration of Vice-President Andrew Johnson (q.v.) as President precipitated a struggle in which most of the Republican senators and members of Congress were arrayed against the President. The Democrats took the side of the President, and with the aid of a few Republicans prevented the adoption of the articles of impeachment presented by the House.

During the reconstruction period that followed, the Democrats insisted that the States which were held in the Union should be given the rights and privileges of other States.

The campaign of 1868 was fought under the leadership of Horatio Seymour of New York and Francis P. Blair of Missouri, and the platform demanded:

1. Immediate restoration of all the States to their rights in the Union under the Constitution, and of civil government to the American people.

2. Amnesty for all past political offenses, and the regulation of the elective franchise in the States by their citizens.

3. Payment of all the public debt of the United States as rapidly as practicable — all money drawn from the people by taxation, except so much as is requisite for the necessities of the government, economically administered, being honestly applied to such payment; and when the obligations of the government do not expressly state upon their face, or the law under which they were issued does not provide that they shall be paid in coin, they ought, in right and justice, to be paid in the lawful money of the United States.

4. Equal taxation of every species of property according to its real value, including government bonds and other public securities.

5. One currency for the government and the people, the laborer and the office-holder, the pensioner, and the soldier, the producer and the bondholder.

6. Economy in the administration of the government; the reduction of the standing army and navy; the abolition of the Freedman's Bureau and all political instrumentalities designed to secure negro supremacy; simplification of the system and discontinuance of inquisitorial modes of assessing and collecting internal revenue; that the burden of taxation may be equalized and lessened, and the credit of the government and the currency made good; the repeal of all enactments for enrolling the State militia into national forces in times of peace; and a tariff for revenue upon foreign imports, and such equal taxation under the internal-revenue laws as will afford incidental protection to domestic manufactures, and as will, without impairing the revenue, impose the least burden upon, and best promote and encourage the great industrial interests of the country.

7. Reform of abuses in the administration; the expulsion of corrupt men from office; the abrogation of useless offices; and the restoration of rightful author-

by the and the independence of, the executive and judicial departments of the government; the subordination of the military to the civil power, to the end that the usurpations of Congress and the despotism of the sword may cease.

8. Equal rights and protection for naturalized and native-born citizens, at home and abroad; the assertion of American nationality which shall command the respect of foreign powers, and furnish an example and encouragement to people struggling for national integrity, constitutional liberty, and individual rights; and the maintenance of the rights of naturalized citizens against the absolute doctrine of immutable allegiance and the claims of foreign powers to punish them for alleged crimes committed beyond their jurisdiction.

Besides this statement of the position of the parties, the platform arraigned the Republican party for its reconstruction policy, charging that instead of restoring the Union it had "so far as was in its power dissolved it and subjected 10 States in time of profound peace to military despotism and negro supremacy," and that it had "nullified the right of trial by jury, abolished the right of *habeas corpus* and overthrown the freedom of speech and press." The Republicans nominated Gen. Grant and Schuyler Colfax, and secured a popular plurality of about 300,000 (less than the plurality of 1864), and an electoral majority of 134.

In May 1872, a convention known as the Liberal Republican Convention was held at Cincinnati, Ohio, and nominated Horace Greeley of New York for President and Benjamin Gratz Brown of Missouri for Vice-President. The platform demanded the recognition of the doctrines of equality of all men before the law, and pledged the party's support to Articles 13, 14 and 15 of our amended national Constitution. It favored the sacred maintenance of the public credit, opposed repudiation and insisted upon the return to specie payments.

The Democrats met on 9 July at Baltimore and nominated the same ticket and adopted a platform substantially like the one adopted by the Liberal Republicans.

Those members of the Democratic party describing themselves as "straight-out" Democrats met 3 September following, and nominated Charles O'Connor of New York for President and John Quincy Adams of Massachusetts for Vice-President; although both declined, nearly 30,000 votes were cast for the head of the ticket. The platform declared that the Baltimore convention had betrayed the party into a false creed and false leadership, and proclaimed that the members of the "straight-out" Democratic party preferred principle to power, and would not surrender those principles in exchange for offices which Presidents confer." The election resulted in an overwhelming victory for the Republican ticket, Grant and Wilson receiving 286 electoral votes out of 349, and a popular plurality of more than 750,000.

The nomination of Horace Greeley brought to his party a large number of influential Republicans and alienated many Democrats, yet the party's vote was only about 125,000 more than the Democratic vote of 1868; while the Republican vote of 1872 was nearly 600,000 greater than the vote of four years before.

The Democrats entered the campaign of 1876 with courage and confidence. The discovery of corruption in several of the departments, and the conviction of officials high in authority, together with the panic of 1873, had broken the prestige of the Republican party and caused a wide-spread demand for reform. The Democratic party took advantage of the situation, and nominated as its candidates Samuel J. Tilden of New York, who had become conspicuous in reform in his State, and Thomas A. Hendricks of Indiana, who represented all that was highest, purest and best in Democratic principle and purpose. The platform described the abuses of power and demanded reform in every department. Among other things it demanded reform in the tariff, and condemned the resumption clause of 1875.

The campaign resulted in a popular plurality of 250,000 for Tilden and Hendricks. The result, however, was disputed, and charges of fraud were made in the election of several States. The situation grew so serious that Congress created an Electoral Commission to which the whole matter was referred. This commission was composed of five senators selected by that body, five members of Congress selected by that body, and the five senior members of the Supreme Court. (See ELECTORAL COMMISSION.)

The Senate being Republican selected 3 Republicans and 2 Democrats; the House being Democratic selected 3 Democrats and 2 Republicans, and of the judges 3 were Republicans and 2 Democrats. The Electoral Commission thus contained 8 Republicans and 7 Democrats, and on every contested question the vote stood 8 to 7, each member casting his vote so that it would aid his party.

The Democrats of 1880 endorsed the principles embodied in the platform of 1876, protested against centralization as dangerous to the government, and denounced the "great fraud of 1876 and 1877 by which upon a false count of the electoral votes of two States the candidate defeated at the polls was declared to be President, and for the first time in American history the will of the people was set aside under a threat of military violence." The righting of the wrong of 1876 was declared to be the paramount issue. Gen. Winfield Scott Hancock, the Democratic nominee, weakened his campaign by putting the tariff question aside as "a local issue." He was defeated, however, by a popular vote of less than 10,000, and by only 50 votes in the Electoral College.

In 1884 the Democrats met at Chicago and nominated Grover Cleveland of New York for President and Thomas A. Hendricks of Indiana for Vice-President. A platform of great length was adopted; the tariff question being the one discussed at great length. The platform contained the following plank on the money question: "We believe in honest money, the gold and silver coinage of the Constitution, and a circulating medium convertible into such money without loss." This platform also contained a plank reaffirming that portion of the Democratic platform of 1856, which endorsed the liberal principles of Jefferson.

The Republican ticket, headed by James G. Blaine and John A. Logan, received a plurality of a little more than 20,000 in the popular vote, but Mr. Cleveland had 37 majority in the Electoral College.

The Democratic platform of 1888 reaffirmed the platform adopted in 1884, and endorsed the President's views on the tariff question as ex-

pressed in the tariff message which he sent to Congress in December 1887. The tariff question was made the paramount issue, and the campaign waged on this question, and resulted in the election of the Republican ticket, and its candidates, Benjamin Harrison and Levi P. Morton, that ticket having a majority of 65 in the Electoral College, although the Democratic ticket had a popular plurality of about 100,000.

During the Cleveland administration an attempt was made to reduce the tariff, and the Mills Bill received the support of the Democratic members of the Senate and House. The Republicans, however, took advantage of the Republican victory of 1888 to propose and enact a high tariff law, known as the McKinley Act, taking its name from the chairman of the Ways and Means Committee of the House. The passage of this law was followed by an increase in prices of commodities, and it became the paramount issue in the following campaign of 1892. The Democratic party that year nominated Grover Cleveland for a third time, and named Adlai E. Stevenson of Illinois as his running mate.

There was a fight in the convention over the tariff plank, and as finally adopted it declared that the Federal government had no constitutional power to impose and collect tariff duties except for revenue only. The trusts were denounced, and the party pledged to the enactment of laws made to prevent and control them.

The money plank of the platform was as follows:

> We denounce the Republican legislation known as the Sherman Act of 1890 as a cowardly makeshift, fraught with possibilities of danger in the future which should make all of its supporters, as well as its author, anxious for its speedy repeal. We hold to the use of both gold and silver as the standard money of the country, and to the coinage of both gold and silver without discrimination against either metal or charge for mintage, but the dollar unit of coinage of both metals must be of equal intrinsic and exchangeable value or be adjusted through international agreement, or by such safeguards of legislation as shall ensure the maintenance of the parity of the two metals, and the equal power of every dollar at all times in the markets and in the payments of debts; and we demand that all paper currency shall be kept at par with and redeemable in such coin. We insist upon this policy as especially necessary for the protection of the farmers and laboring classes, the first and most defenseless victims of unstable money and a fluctuating currency.

President Harrison was renominated by the Republicans and Whitelaw Reid was placed upon the ticket with him. In the election the Democratic ticket polled a plurality of 132 in the Electoral College and a popular plurality of about 380,000. The People's Party nominated James B. Weaver of Iowa for President and James G. Field of Virginia for Vice-President, and polled a little more than 1,000,000 votes.

During President Cleveland's second term, two questions occupied public attention, the money question and the tariff question. Congress was called together in extraordinary session in August 1893, and the President recommended the unconditional repeal of the Sherman law. By reference to the Democratic platform of 1892 it will be seen that the money plank contained a statement of the party's faith in the double standard, as well as its desire for the repeal of the Sherman Act, and an effort to repeal the makeshift without restoring the double standard caused a division in the ranks of the party, but the President succeeded in securing the legislation which he desired; doing this, however, he had the support of a larger percentage of the Republican senators and members than he had of the Democrats.

Congressman Wilson, chairman of the Ways and Means Committee, reported a measure which bears his name, and the bill as it passed the House was satisfactory to the friends of tariff reform, but it was emasculated by the Senate, where a coterie of Democratic senators refused to support it until the rates of several schedules were raised. The President refused to sign the bill, but allowed it to become a law without his signature. The bill contained an income tax, but this clause was declared unconstitutional by the Supreme Court, the vote standing 5 to 4. The decision was rendered at the second hearing; at the first hearing the vote stood 4 to 4, and as the 9th judge who was not present until the second hearing favored the tax, it required a change of opinion on the part of one of the judges to render the income tax inoperative.

After the passage of the tariff law the currency question again occupied the attention of Congress and became the paramount issue in the campaign of 1896. The money issue was fought out in the party and the delegates to the Chicago convention were instructed to carry out the financial policy endorsed by the members of the State convention selecting them, who in turn had been instructed by county conventions. As a result of this inter-party contest, the advocates of bimetallism won a decisive victory, having more than two thirds of the national delegates.

The following platform was adopted:

> We, the Democrats of the United States in National Convention assembled, do reaffirm our allegiance to those great essential principles of justice and liberty, upon which our institutions are founded, and which the Democratic party has advocated from Jefferson's time to our own — freedom of speech, freedom of press, freedom of conscience, the preservation of personal rights, the equality of all citizens before the law, and the faithful observance of constitutional limitations.
>
> During all these years the Democratic party has resisted the tendency of selfish interests to the centralization of governmental power, and steadfastly maintained the integrity of the dual scheme of government established by the founders of this Republic of republics. Under its guidings and teachings the great principle of local self-government has found its best expression in the maintenance of the rights of the States and in its assertion of the necessity of confining the general government to the exercise of the powers granted by the Constitution of the United States.
>
> The Constitution of the United States guarantees to every citizen the rights of civil and religious liberty. The Democratic party has always been the exponent of political liberty and religious freedom, and it renews its obligations and reaffirms its devotions to these fundamental principles of the Constitution.
>
> Recognizing that the money question is paramount to all others at this time, we invite attention to the fact that the Federal Constitution named silver and gold together as the money metals of the United States, and that the first coinage law passed by Congress under the Constitution made the silver dollar the monetary unit and admitted gold to free coinage at a ratio based upon the silver-dollar unit.
>
> We declare that the act of 1873 demonetizing silver without the knowledge or approval of the American people has resulted in the appreciation of gold and a corresponding fall in the prices of commodities produced by the people; a heavy increase in the burden of taxation and of all debts, public and private; the

enrichment of the money-lending class at home and abroad, the prostration of industry and impoverishment of the people.

We are unalterably opposed to monometallism, which has locked fast the prosperity of an industrial people in the paralysis of hard times. Gold monometallism is a British policy, and its adoption has brought other nations into financial servitude to London. It is not only un-American, but anti-American, and it can be fastened on the United States only by the stifling of that spirit and love of liberty which proclaimed our political independence in 1776 and won it in the War of the Revolution.

We demand the free and unlimited coinage of both silver and gold at the present legal ratio of 16 to 1 without waiting for the aid or consent of any other nation. We demand that the standard silver dollar shall be a full legal tender, equally with gold, for all debts, public and private, and we favor such legislation as will prevent for the future the demonetization of any kind of legal-tender money by private contract.

We are opposed to the policy and practice of surrendering to the holders of the obligations of the United States the option reserved by law to the government of redeeming such obligations in either silver coin or gold coin.

We are opposed to the issuing of interest-bearing bonds of the United States in time of peace and condemn the trafficking with banking syndicates, which, in exchange for bonds and at an enormous profit to themselves, supply the Federal treasury with gold to maintain the policy of gold monometallism.

Congress alone has the power to coin and issue money, and President Jackson declared that this power could not be delegated to corporations or individuals. We, therefore, denounce the issuance of notes intended to circulate as money by national banks as in derogation of the Constitution, and we demand that all paper which is made a legal tender for public and private debts, or which is receivable for dues to the United States, shall be issued by the government of the United States and shall be redeemable in coin.

We hold that tariff duties shall be levied for purposes of revenue, such duties to be so adjusted as to operate equally throughout the country, and not discriminate between class or section, and that taxation should be limited by the needs of the government, honestly and economically administered. We denounce as disturbing to business the Republican threat to restore the McKinley law, which has twice been condemned by the people in national elections, and which, enacted under the false plea of protection to home industry, proved a prolific breeder of trusts and monopolies, enriched the few at the expense of the many, restricted trade and deprived the producers of the great American staples of access to their natural markets.

Until the money question is settled we are opposed to any agitation for further changes in our tariff laws, except such as are necessary to meet the deficit in revenue caused by the adverse decision of the Supreme Court on the income tax. But for this decision by the Supreme Court there would be no deficit in the revenue under the law passed by a Democratic Congress in strict pursuance of the uniform decisions of that court for nearly 100 years, that court having in that decision sustained constitutional objections to its enactment which had previously been overruled by the ablest judges who have ever sat on that bench. We declare that it is the duty of Congress to use all the constitutional power which remains after that decision, or which may come from its reversal by the court as it may hereafter be constituted, so that the burdens of taxation may be equally and impartially laid, to the end that wealth may bear its due proportion of the expense of the government.

We hold that the most efficient way of protecting American labor is to prevent the importation of foreign pauper labor to compete with it in the home market, and that the value of the home market to our American farmers and artisans is greatly reduced by a vicious monetary system which depresses the prices of their products below the cost of production, and thus deprives them of the means of purchasing the products of our home manufactories; and as labor creates the wealth of the country, we demand the passage of such laws as may be necessary to protect it in all its rights.

We are in favor of the arbitration of differences between employers engaged in interstate commerce and their employees, and recommend such legislation as is necessary to carry out this principle.

The absorption of wealth by the few, the consolidation of our leading railroad systems, and the formation of trusts and pools require a stricter control by the Federal government of those arteries of commerce. We demand the enlargement of the power of the Inter-State Commerce Commission and such restriction and guarantees in the control of railroads as will protect the people from robbery and oppression.

We denounce the prodigate waste of the money wrung from the people by oppressive taxation and the lavish appropriations of recent Republican congresses, which have kept taxes high, while the labor that pays them is unemployed and the products of the people's toil are depressed in price till they no longer repay the cost of production. We demand a return to that simplicity and economy which befits a Democratic government and a reduction in the number of useless offices the salaries of which drain the substance of the people.

We denounce arbitrary interference by Federal authorities in local affairs as a violation of the Constitution of the United States and a crime against free institutions, and we especially object to government by injunction as a new and highly dangerous form of oppression by which the Federal judges, in contempt of the laws of the States and rights of citizens, become at once legislators, judges, executioners; and we approve the bill passed at the last session of the United States Senate, and now pending in the House of Representatives, relative to contempts in Federal courts and providing for trials by jury in certain cases of contempt.

No discrimination should be indulged in by the government of the United States in favor of any of its debtors. We approve of the refusal of the Fifty-third Congress to pass the Pacific Railroad Funding Bill and denounce the effort of the present Republican Congress to enact a similar measure.

Recognizing the just claims of deserving Union soldiers, we heartily endorse the rule of the present commissioner of pensions, that no names shall be arbitrarily dropped from the pension roll; and the fact of enlistment and service should be deemed conclusive evidence against disease and disability before enlistment.

We favor the admission of the Territories of New Mexico, Arizona, and Oklahoma into the Union as States, and we favor the early admission of all the Territories having the necessary population and resources to entitle them to Statehood, and, while they remain Territories, we hold that the officials appointed to administer the government of any Territory, together with the District of Columbia and Alaska, should be *bona fide* residents of the Territory or District in which their duties are to be performed. The Democratic party believes in home rule and that all public lands of the United States should be appropriated to the establishment of free homes for American citizens.

We recommend that the Territory of Alaska be granted a delegate in Congress and that the general land and timber laws of the United States be extended to said Territory.

The Monroe Doctrine, as originally declared, and as interpreted by succeeding Presidents, is a permanent part of the foreign policy of the United States and must at all times be maintained.

We extend our sympathy to the people of Cuba in their heroic struggle for liberty and independence.

We are opposed to life tenure in the public service, except as provided in the Constitution. We favor appointments based on merit, fixed terms of office, and such an administration of the civil-service laws as will afford equal opportunities to all citizens of ascertained fitness.

We declare it to be the unwritten law of this Republic, established by custom and usage of one hundred years and sanctioned by the examples of the greatest and wisest of those who founded and have maintained our government, that no man should be eligible for a third term of the Presidential office.

The Federal government should care for and improve the Mississippi River and other great waterways of the Republic, so as to secure for the interior States easy and cheap transportation to tide water. When any waterway of the Republic is of sufficient importance to demand aid of the government, such aid should be extended upon a definite plan of continuous work until permanent improvement is secured.

Confiding in the justice of our cause and the necessity of its success at the polls, we submit the foregoing declaration of principles and purposes to the considerate judgment of the American people. We invite the support of all citizens who approve them and who desire to have them made effective through legislation,

for the relief of the people and the restoration of the country's prosperity.

The minority, led by Senator Hill of New York, submitted the following, which was rejected by the convention.

To the Democratic National Convention: 16 delegates, constituting the minority of the Committee on Resolutions, find many declarations in the report of the majority to which they cannot give their assent. Some of these are wholly unnecessary. Some are ill considered and ambiguously phrased, while others are extreme and revolutionary of the well-recognized principles of the party. The minority content themselves with this general expression of their dissent, without going into a specific statement of the objectionable features of the report of the majority; but upon the financial question, which engages at this time the chief share of public attention, the views of the majority differ so fundamentally from what the minority regard as vital Democratic doctrine as to demand a distinct statement of what they hold to as the only just and true expression of Democratic faith upon the paramount issue, as follows, which is offered as a substitute for the financial plank in the majority report:

"We declare our belief that the experiment on the part of the United States alone of free silver coinage and a change of the existing standard of value independently of the action of other great nations, would not only imperil our finances, but would retard or entirely prevent the establishment of international bimetallism, to which the efforts of the government should be steadily directed. It would place this country at once upon a silver basis, impair contracts, disturb business, diminish the purchasing power of the wages of labor, and inflict irreparable evils upon our nation's commerce and industry.

"Until international co-operation among leading nations for the coinage of silver can be secured we favor the rigid maintenance of the existing gold standard as essential to the preservation of our national credit, the redemption of our public pledges, and the keeping inviolate of our country's honor. We insist that all our paper and silver currency shall be kept absolutely at a parity with gold. The Democratic party is the party of hard money and is opposed to legal tender paper money as a part of our permanent financial system, and we therefore favor the gradual retirement and cancellation of all United States notes and Treasury notes, under such legislative provisions as will prevent undue contraction. We demand that the national credit shall be resolutely maintained at all times and under all circumstances."

The minority also feel that the report of the majority is defective in failing to make any recognition of the honesty, economy, courage and fidelity of the present Democratic administration. And they therefore offer the following declaration as an amendment to the majority report: "We commend the honesty, economy, courage and fidelity of the present Democratic National Administration."

The main resolutions submitted by the minority were rejected by more than a two thirds vote, and the platform as reported by the committee was adopted by the same vote. The resolution endorsing the administration was defeated by a little less than two thirds.

The convention named as its candidates William Jennings Bryan of Nebraska, and Arthur Sewall of Maine. The "National" Democrats met at Indianapolis in September following, issued a platform endorsing the gold standard and named John M. Palmer and Simon B. Buckner as their national ticket. William McKinley of Ohio, and Garrett A. Hobart of New Jersey were the nominees of the Republican convention. The platform contained a plank favoring a protective tariff, and a plank opposing free coinage until foreign co-operation could be secured, but pledging the party to promote international bimetallism.

The People's party, generally known as the Populist party, met at St. Louis and adopted a platform containing the same silver plank as the Democratic platform and endorsed and nominated the Democratic candidate for President. Instead of endorsing Mr. Sewall for the Vice-Presidency, the convention named Thomas E. Watson of Georgia for that office. The Silver Republicans met at the same time, endorsed the Democratic ticket and adopted a silver plank identical with the Democratic plank.

The campaign aroused deep feeling on both sides, and was warmly contested in the Central States. It became apparent early in the campaign that the Democratic ticket would carry the Western and Southern States, and that the Republican ticket would sweep the Eastern States. A very large vote was polled, the total that year being nearly 2,000,000 in excess of the total vote of four years before. The Republican party secured a popular plurality of 601,854. The electoral vote stood, McKinley and Hobart 271; Bryan and Sewall, 176.

Between 1896 and 1900 there was an improvement in industrial conditions, an increase in the volume of money, and a series of wars throughout the world. In 1898 the United States interfered in behalf of the Cubans and became involved in a war with Spain, which war resulted in Cuban independence, but during the war a naval victory in the Philippines put this nation in temporary control of those islands and resulted in our possession of them as an indemnity for the expenses incurred in behalf of the Cubans. The cession of the Philippine Islands to the United States raised a question which has not yet been settled. The sentiment is at present divided, the Democrats favoring the immediate promise that independence will be given as soon as a stable government is established, this independence to be accompanied by protection from outside interference. Some of the Republicans desire that the Philippine Islands be held under a colonial system, and others desire that the islands be given a territorial form of government with a view to ultimate statehood.

The Democratic convention which met at Kansas City, 4 July 1900, endorsed the Declaration of Independence, and adopted the following platform:

"We, the representatives of the Democratic party of the United States, assembled in national convention on the anniversary of the adoption of the Declaration of Independence, do reaffirm our faith in that immortal proclamation of the inalienable rights of man and our allegiance to the Constitution framed in harmony therewith by the fathers of the Republic. We hold with the United States Supreme Court that the Declaration of Independence is the spirit of our government, of which the Constitution is the form and letter.

We declare again that all governments instituted among men derive their just powers from the consent of the governed; that any government not based upon the consent of the governed is tyranny, and that to impose upon any people a government of force is to substitute the methods of imperialism for those of a republic. We hold that the Constitution follows the flag, and denounce the doctrine that an Executive or Congress, deriving their existence and their powers from the Constitution, can exercise lawful authority beyond it or in violation of it.

We assert that no nation can long endure half republic and half empire, and we warn the American people that imperialism abroad will lead quickly and inevitably to despotism at home.

Believing in these fundamental principles, we denounce the Porto Rican law, enacted by a Republican Congress against the protest and opposition of the Democratic minority, as a bold and open violation of the nation's organic law and a flagrant breach of the national good faith. It imposes upon the people of

Porto Rico a government without their consent and taxation without representation. It dishonors the American people by repudiating a solemn pledge made in their behalf by the commanding general of our army, which the Porto Ricans welcomed to a peaceful and unresisted occupation of their land. It doomed to poverty and distress a people whose helplessness appeals with peculiar force to our justice and magnanimity.

In this, the first act of its imperialistic programme, the Republican party seeks to commit the United States to a colonial policy inconsistent with republican institutions and condemned by the Supreme Court in numerous decisions.

We condemn and denounce the Philippine policy of the present administration. It has involved the public in unnecessary war, sacrificed the lives of many of our noblest sons and placed the United States, previously known and applauded throughout the world as the champion of freedom, in the false and un-American position of crushing with military force the efforts of our former allies to achieve liberty and self-government. The Filipinos cannot be citizens without endangering our civilization; they cannot be subjects without imperiling our form of government, and as we are not willing to surrender our civilization or to convert the republic into an empire, we favor an immediate declaration of the nation's purpose to give the Filipinos, first, a stable form of government; second, independence; and, third, protection from outside interference, such as has been given for nearly a century to the republics of Central and South America.

We are not opposed to territorial expansion when it takes in desirable territory which can be erected into States in the Union and whose people are willing and fit to become American citizens. We favor expansion by every peaceful and legitimate means. But we are unalterably opposed to seizing or purchasing distant islands to be governed outside the Constitution and whose people can never become citizens.

We are in favor of extending the Republic's influence among the nations, but believe that influence should be extended, not by force and violence, but through the persuasive power of a high and honorable example. The importance of other questions now pending before the American people is no wise diminished, and the Democratic party takes no backward step from its position on them, but the burning issue of imperialism growing out of the Spanish war involves the very existence of the republic and the destruction of our free institutions. We regard it as the paramount issue of the campaign.

The declaration in the Republican platform adopted at the Philadelphia convention, held in June 1900, that the Republican party "steadfastly adheres to the policy announced in the Monroe Doctrine," is manifestly deceptive. This profession is contradicted by the avowed policy of that party, in opposition to the spirit of the Monroe Doctrine, to acquire and hold sovereignty over large areas of territory and large numbers of people in the eastern hemisphere. We insist on the strict maintenance of the Monroe Doctrine in all its integrity, both in letter and in spirit, as necessary to prevent the extension of European authority on this continent and as essential to our supremacy in American affairs. At the same time we declare that no American people shall ever be held by force in unwilling subjection to European authority.

We oppose militarism. It means conquest abroad and intimidation and oppression at home. It means the strong arm which has ever been fatal to free institutions. It is what millions of our citizens have fled from in Europe. It will impose upon our peace-loving people a large standing army and unnecessary burden of taxation, and will be a constant menace to their liberties. A small standing army and a well disciplined State militia are amply sufficient in time of peace. This republic has no place for a vast military service and conscription.

In time of danger the volunteer soldier is his country's best defender. The National Guard of the United States should ever be cherished in the patriotic hearts of a free people. Such organizations are ever an element of strength and safety. For the first time in our history and coevil with the Philippine conquest has there been a wholesale departure from our time-honored and approved system of volunteer organization. We denounce it as un-American, un-Democratic and un-Republican and as a subversion of the ancient and fixed principles of a free people.

Private monopolies are indefensible and intolerable. They destroy competition, control the price of all material and of the finished product, thus robbing both producer and consumer. They lessen the employment of labor, and arbitrarily fix the terms and conditions thereof, and deprive individual energy and small capital of their opportunity for betterment. They are the most efficient means yet devised for appropriating the fruits of industry to the benefit of the few at the expense of the many, and unless their insatiate greed is checked all wealth will be aggregated in a few hands and the republic destroyed.

The dishonest paltering with the trust evil by the Republican party in State and national platforms is conclusive proof of the truth of the charge that trusts are the legitimate product of Republican policies, that they are fostered by Republican laws, and that they are protected by the Republican administration in return for campaign subscriptions and political support.

We pledge the Democratic party to an unceasing warfare in nation, State and city against private monopoly in every form. Existing laws against trusts must be enforced, and more stringent ones must be enacted providing for publicity as to the affairs of corporations engaged in interstate commerce, requiring all corporations to show, before doing business outside the State of their origin, that they have no water in their stock, and that they have not attempted, and are not attempting, to monopolize any branch of business or the production of any articles of merchandise, and the whole constitutional power of Congress over interstate commerce, the mails and all modes of interstate communication shall be exercised by the enactment of comprehensive laws upon the subject of trusts.

Tariff laws should be amended by putting the products of trusts upon the free list, to prevent monopoly under the plea of protection.

The failure of the present Republican administration, with an absolute control over all the branches of the national government, to enact any legislation designed to prevent or even curtail the absorbing power of trusts and illegal combinations, or to enforce the anti-trust laws already on the statute books, proves the insincerity of the high-sounding phrases of the Republican platform.

Corporations should be protected in all their rights, and their legitimate interests should be respected, but any attempt by corporations to interfere with public affairs of the people or to control the sovereignty which creates them should be forbidden under such penalties as will make such attempts impossible.

We condemn the Dingley tariff law as a trust-breeding measure, skilfully devised to give the few favors which they do not deserve and to place upon the many burdens which they should not bear.

We favor such an enlargement of the scope of the interstate commerce law as will enable the commission to protect individuals and communities from discriminations and the public from unjust and unfair transportation rates.

It will be seen that the question of imperialism was made the paramount issue, the trust question coming next in the amount of attention given to it. The convention, however, reaffirmed the principles embodied in the Chicago platform, and reiterated the position taken four years before on the money question and on several other questions.

Mr. Bryan was renominated and Adlai E. Stevenson of Illinois was placed upon the ticket as the candidate for Vice-President. This ticket was endorsed later by the People's Party convention, and by the Silver Republican convention, both of which parties adopted platforms in line with the Democratic platform upon the leading issues. The Democratic ticket was also endorsed by the Anti-imperialists.

While the Democrats tried to focus public attention upon the menace of imperialism, the Republicans said: "Let well enough alone," and credited the improved conditions of the people in part to the gold standard and in part to the high-tariff law enacted in 1898. They protested against any change in the financial laws or the tariff law, and denied that they intended any

departure from the principles of free government.

The Republican ticket, headed by President McKinley and Theodore Roosevelt of New York, was again successful, the popular plurality being 849,455. The electoral vote stood, McKinley and Roosevelt 292, Bryan and Stevenson 155. The campaign of 1900 did not excite as much interest as the preceding campaign. In 1904 Alton B. Parker of New York was nominated for President, with Henry G. Davis of West Virginia for Vice-President. In this election the party practically reversed its previous position on the money question. The Republican party, with a ticket headed by President Roosevelt, was again successful, the electoral vote standing 336 to 140.

In the foregoing review an attempt has been made to present a history of the Democratic party from its organization to the present time, and the party's position on public issues has been shown by quotations from the platforms adopted by its national conventions. While platforms are not so specific as laws, and not so elaborate as speeches, they are probably a better index to the general thought and purpose of parties than either laws and speeches — for the reason that laws are often compromises, and speeches may represent the individual opinions of the speakers rather than of the party, while platforms are written by delegates chosen for that purpose.

It will be seen that the party has met with successes and reverses, but it is also noticeable that it has adhered to its principles regardless of the immediate effect of those principles upon it. For instance, it was defeated in 1840, and yet the platform of 1840 was constantly reaffirmed and reiterated for 20 years afterward. The platform of 1892 reaffirmed and even made stronger the platform of 1888, upon which the party had suffered defeat.

It may be said, however, in conclusion, that there is to-day and will continue to be an imperative need for a party thoroughly committed to the defense of the inalienable rights of the individual and to local self-government, and jealous of the encroachments of Federal power. Even when such a party is not in power, it exercises a potent influence in molding public opinion and in restraining excesses, because it is very quick to champion the cause of an individual whose rights have been trespassed upon, or the cause of a community whose rights have been ignored. In proportion as the organization is true to the principles promulgated by Jefferson and defended by Jackson, it may hope to appeal to the confidence of those who seek neither favoritism nor privileges, but are content to enjoy the blessings of a government in which each individual is protected in the enjoyment of life and liberty and in the pursuit of happiness.

Bibliography.— Benton, 'Thirty Years' View'; Blaine, 'Twenty Years of Congress'; Cooper, 'American Politics'; Cox, 'Three Decades of Federal Legislation'; 'Jefferson Cyclopedia'; Jefferson, 'Complete Works'; Taylor, 'Cyclopedia of Political Science'; Vincent, 'Platform Text-Book.'

WILLIAM JENNINGS BRYAN.

Democratic Societies in the United States, 1793. The masses in this country sympathized with the French Revolution, as essentially the same with their own, and would have liked an open stand by the government on that side. Instead, the attempt of Edmond Genet (q.v.) to drag the country into an active alliance with France, forced Washington to proclaim neutrality. This irritated popular feeling, and made it worth while for local politicians to organize a faction on the basis of French sympathies, ignoring American questions wholly. It is curious that this basic element of the Democratic or "people's party," which charged the Federalists with being anti-national, monarchic, and a "British party," was itself the only purely foreign party ever known in the United States. In all the considerable towns, clubs were organized in imitation of the Jacobin clubs of France: indeed, that of Charleston openly claimed to be a branch of them, and was formally recognized as such. As usual in such cases, they mimicked ludicrously the outer semblance of their prototypes, without regard to American fitness: wore cockades and liberty caps, called each other "citizen" and "citizeness," held banquets of fraternity, etc. They were at first looked down upon by the "Republicans" or opponents of the Federalists on American questions, who accepted their votes but scorned their antics and irrelevancy; but common political opposition soon forced them into a common organism, which was called Democratic-Republican, still the official name of the party. Washington's denunciation of the societies in 1794, as having fostered the Whiskey Insurrection (q.v.), which in fact they approved, the atrocities of the Reign of Terror, and the final downfall of Robespierre and the Jacobin Club of Paris,— perhaps equally the fact that the craze had become a bore,— caused the general disappearance of the clubs or societies in 1794–5.

Democ'ritus, Greek philosopher of the new Eleatic school: b. Abdera between 470 and 460 B.C.; d. 370 B.C. Some Magi and Chaldeans, whom Xerxes left on his return from his Grecian expedition, are said to have excited in Democritus the first inclination for philosophy. After the death of his father he traveled to Egypt, where he studied geometry, and probably visited other countries, to extend his knowledge of nature. Among the Greek philosophers he enjoyed the instruction of Leucippus. He afterward returned to his native city, where he was placed at the head of public affairs. Indignant at the follies of the Abderites, he resigned his office, and retired to solitude, to devote himself exclusively to philosophical studies.

In his system he developed still further the mechanical or atomical theory of his master Leucippus. Thus he explained the origin of the world by the eternal motion of an infinite number of invisible and indivisible bodies, atoms, which differ from one another in form, position, and arrangement, and are alternately separated and combined by their motions in infinite space. In this way the universe was formed, fortuitously, without the interposition of a First Cause. Although denying the presence of design in nature, he admitted that of law. He called the common notion of chance a cover of human ignorance, the refuge of those who are too idle to think. The eternal existence of atoms (of matter in general) he inferred from

the consideration that time could be conceived only as eternal and without beginning. In the atoms he distinguished figure, size, gravity, and impenetrability. Fire consists, according to him, of active globules, and spreads, like a light envelope, round the earth. The soul consists, in as far as it is a moving power, of the finest fire-atoms; but since it is acquainted with the other elements, and anything can be known only by its equal, it must be composed in part also from the other elements. The continuation of the soul after death was denied by Democritus, who divided it into two parts: into the rational part, which has its seat in the breast; and the sensual part, which is diffused through the whole body. Both constitute only one substance. He applied his atomical theory, also, to natural philosophy and astronomy. Even the gods he considered to have arisen from atoms, and to be perishable like the rest of things existing. In his ethical philosophy Democritus considered the acquisition of peace of mind as the highest aim of existence. The purest joy and the truest happiness are only the fruit of the higher mental activity exerted in the endeavor to understand the nature of things, of the peace of mind arising from good actions, and of a clear conscience.

Demogeot, Jacques Claude, zhăk klōd dē-mō-zhō, French historian and poet: b. Paris 5 July 1808; d. there 9 Jan. 1894. He wrote a 'Study of Pliny the Younger'; 'Letters and Men of Letters in the 10th Century'; 'French Literature in the 17th Century,' his greatest work. His poetical writings are a drama, 'Romeo and Juliet' (1852); 'New Paris,' consisting of epico-lyric descriptions; and 'Stories and Talks in Verse' (1860).

Demogor'gon, dē-mō-gôr'gŏn, a mysterious divinity in pagan mythology, viewed as an object of terror rather than of worship. First mentioned by Lactantius (or Lutatius) Placidus in a commentary on Statius, about the 5th century A.D. By some regarded as the author of creation, and by others as a famous magician, to whose spell all the inhabitants of Hades were subjected. In Shelley's 'Prometheus Unbound' it is this dread power of the Demogorgon that overthrows Love.

Demog'raphy, or **Demology** (Gr. *demos,* the people, and *graphein* to write, describe), is the science of peoples or of population. This science deals with the ethnical affinities of nations, and the characteristics, physical and intellectual, that result therefrom. This descriptive portion of the science is however quite subsidiary to the economic and statistical object of demography. The increase and decrease of population, and the subsistence obtainable for the support of races, problems such as Malthus discussed, all belong to this science which is more than ever engaging the study of learned men. C. Engels has extended the meaning of the term far beyond the field of mere statistics and has made it to include the political and social idiosyncrasies of races. This opens a wide speculative area, which gives a new importance to the subject. The results of all demographical investigations are such, however, as can be stated in mathematical terms. See Kumelin, 'Zur Theorie der Statistik'; C. Engels, 'Darstellung seines demologischen Systems'; Guillard, 'Eléments de Statistique Humaine ou Demographie comparee.'

Demoiselle, dă-mwä-zĕl', the Numidian crane (*Anthropoides virgo*), an African bird which visits the south of Europe. It is about three feet in length, and differs from the true cranes in having the head and neck quite feathered and the tertials of the wings elongated and hanging over the tail. It has its name from its gracefulness and symmetry of form.

Demoivre, dē-mwävr, Abraham, French mathematician: b. Vitry 26 May 1667; d. London 27 Nov. 1754. He settled in London after the revocation of the Edict of Nantes, and gained a livelihood by becoming a teacher of mathematics. His chief works are: 'Miscellanea Analytica'; 'The Doctrine of Chances, or a Method of Calculating the Probabilities of Events at Play'; and a work on 'Annuities'; besides 'Papers' in the 'Transactions' of the Royal Society, of which he was a Fellow.

Demon (Greek, *daimon*), a name given by the ancients to a spirit or genius supposed to hold an intermediate place between men and the celestial deities. In Homer we find the term *daimon* sometimes applied to one or other of the gods; but it is commonly used by him in a general sense, as when we speak of "the Deity" or "Providence." Daimon is probably derived from *daiō,* to divide or distribute, though some look upon it as equivalent to *daemon,* intelligent or wise. Hesiod uses *daimon* in a different sense from Homer. He admitted four classes of rational beings — gods, demons, heroes, and men. A strict classification was not made until the popular belief had been introduced into the schools of the philosophers. Aristotle divides the immortals into gods and demons: the mortals into heroes and men. In the Greek philosophy these demons early played an important part. Thales and Pythagoras, Socrates and Xenophon, Empedocles and the Stoics, invented many fictions concerning them, each in his own way. The poetic Plato, however, goes further than any of the others. In 'The Banquet Dialogue' the character of the demons is thus explained: "Demons are intermediate between God and mortals; their function is to interpret and convey to the gods what comes from men, and to men what comes from the gods; the prayers and offerings of the one, and the commands of the others. These demons are the source of all prophecy, and of the art of the priests, in relation to sacrifices, consecrations, conjurations; for God has no immediate intercourse with men, but all the intercourse and conversation between the gods and mortals is carried on by means of the demons, both in waking and in sleeping. There are many kinds of such demons or spirits." In other places he says of them, they are clothed with air, wander over heaven, hover over the stars, and abide on the earth; they behold unveiled the secrets of the time to come, and regulate events according to their pleasure; every mortal receives at birth a particular demon, who accompanies him until his end, and conducts his soul to the place of purification and punishment. Later writers divided them, in reference to the effects ascribed to them, into good and bad spirits — Agathodemons and Cacodemons. The Romans still further developed the Greek demonology; with

less, however, of a poetical character, and mixed with Etruscan notions.

A full and systematic development of demonism is found in Buddhism, which recognizes six classes of beings in the universe, two only of which, those of men and angels, are good; the other four — the Asuras, irrational animals, Pretas or goblins, and the denizens of hell — are evil. The Asuras are the most powerful of the wicked spirits, and are at constant war with the gods (Devas). They dwell beneath the three-pronged root of the world-mountain, occupying the nadir; while their great enemy, Indra, the highest Buddhist god, sits upon the pinnacle of the mountain in the zenith. With the Asuras are associated numerous groups, as the Rakshasas, gigantic opponents of the gods, terrible ogres with bloody tongues and long tusks eager to devour human beings, and lurking in fields and forests; the Nagas, snakes with human faces; the Mahoragas, great dragons; the Pishatshas or Vampires, etc. According to their nature and office, the different species of demons dwell in the air, the water, or the earth, in holes, dens, or clefts. See *Religion* under EGYPT; and also HEBREWS; ZOROASTER.

In the New Testament we find demons, "devils," or "unclean spirits" occupying a prominent place, the Greek word used being generally *daimonion* (a neuter adjectival noun from *daimon*). These spirits are represented as entering into and "possessing" human beings, injuriously affecting them in some strange manner, and as being "cast out" by Christ and his disciples, and even by some among the Jews themselves (Luke ii. 19). Very different views are held regarding these accounts of demoniacal possession. Some regard them as plain statements of fact, believing that "nothing can be more plainly declared than that demons obtained possession of man's soul and body, so as to assert their mastery, and that by our Lord and his agents they were miraculously driven out." "There is every reason to suppose that as the world has become Christian, the powers of evil have been controlled and rendered unable to gain such possession of men as they did in Judæa, and neighboring places, in the time of our Lord and the apostles, and as they are said to do in some parts of the world now. It is believed, moreover, that when Christ was on earth, the Devil put forth his utmost power, knowing that his time was short, and that he was then suffered to put forth a stronger hand than before or since in order that the triumph of Christ might be more conspicuous." These sentences, from Blunt's 'Dictionary of Doctrinal and Historical Theology,' represent what may be called a highly orthodox view of the subject of possession. The same writer admits that "the symptoms of possession, as described in the Gospels, are those of some ordinary diseases, and we have one case which might be put down as confirmed epilepsy with suicidal mania." The Roman Catholic Church teaches that there can be no doubt of the actuality of demoniacal possession. See EXORCISM.

In the opinion of some writers the persons spoken of in the New Testament as possessed of devils were really sufferers from common diseases, being the unhappy victims of madness, monomania, hypochondria, hysteria, epilepsy, and kindred ailments; and that Christ in dealing with them merely accommodated his language to the prevalent opinions of the time.

However much the first teachers of Christianity participated in the beliefs of their fellow-countrymen respecting the doctrine of spirits, there can be no doubt that their successors, the fathers and teachers of the Church, were considerably influenced by the popular ideas on this subject. In the early Church the "energumens" or persons possessed were recognized as a distinct class, and the Church originated a regular discipline in regard to them. The lives of the saints and holy men and women contain many a story in which demons figure, and the office of exorcist was long one of importance. It did not readily occur to the Jew or early Christian to deny even the existence of the gods of the heathen nations; they were simply regarded as demons or devils. We thus find in literature up till the Middle Ages, and even on this side of them, the divinities of Oriental, classical, and Scandinavian mythology figuring as princes of hell. See such works as Sir Walter Scott, 'Demonology and Witchcraft'; Conway, 'Demonology and Devil-lore'; and for the demons of Scripture the dictionaries of the Bible, as Smith, Hastings, and the 'Encyclopædia Biblica' (Vol. I. 1899); also Horst, 'Dæmonomagie' (2 vols. 1818); and 'Zauberbibliothek' (6 vols. 1821–6); Ukert, 'Ueber Däimonen, Heroen, und Genien' (1850); Bastian, 'Der Mensch in der Geschichte' (3 vols. 1860); Taylor, 'Primitive Culture' (2 vols. 1871); Roskoff's admirably learned 'Geschichte des Teufels' (2 vols. 1869); also some of the older books, as Bodin, 'De Magorum Demonomania' (1581); and the like. See ANGEL; ANIMISM; DEVIL; EVIL; EXORCISM; HELL; SERPENT-WORSHIP; WEREWOLF; WITCHCRAFT; ZOROASTER.

Demonetization. See BIMETALLISM.

Demo'niac, a person whose mental faculties are overpowered, and whose body is possessed and actuated by some created spiritual being; especially a person possessed of or controlled by evil spirits.

Demonstration, a proof in which the conclusion necessarily follows from the premises, and the rejection of the conclusion, therefore, always involves a contradiction. The great domain of demonstration is mathematics, in which all the proofs, however complicated, are drawn from a few simple axioms, founded on intuitive perception of number, time, and space. In ordinary language, however, demonstration is often used as synonymous with proof, and sometimes even more loosely as synonymous with explanation and exhibition, as when we speak of anatomical demonstration. In military tactics it is an operation which may be performed to the end of deceiving the enemy in regard to the real measures to be taken against it.

Demophon, or **Demophoon,** in mythology, the son of Celeus and Matanira, whom Ceres loved so passionately that she wanted to make him immortal. To attain that purpose she made him pass through fire, but, being disturbed by the cries of his mother, who chanced to see him, the goddess hurriedly mounted her car, leaving Demophon to perish in the flames.

De Morgan, Augustus, English mathematician: b. Madura, southern India, 27 June 1806; d. London 18 March 1871. In 1828 he was appointed professor of mathematics in University

College, or as it was then called, London University—a situation which he held until 1866, with the exception of the five years from 1831 to 1836. Previous to this appointment he had turned his mathematical attainments to account in the service of some of the London assurance companies, and continued throughout his life the confidential adviser of some of the most important of these associations. Among his many works are: 'Elements of Arithmetic' (1830); 'Elements of Algebra' (1835); 'Elements of Trigonometry' (1837); 'Essay on Probabilities and on Their Application to Life Contingencies and Insurance Offices' (1838); 'Formal Logic' (1847).

Demos'thenes, famous Greek orator: b. Athens 384 or 385 B.C.; d. 322 B.C. His father left him a considerable fortune, of which his guardians attempted to defraud him. Demosthenes, at the age of 17 years, conducted a suit against them himself, and gained his cause. He studied rhetoric under Isæus, and benefited in some degree from the teachings of Isocrates and Plato. But nature had placed great obstacles in his way, and his first attempts to speak in public were attended with derision. He not only had very weak lungs and a shrill voice, but was unable to pronounce the letter *r*. These natural defects he endeavored to remedy by the greatest exertions. He succeeded by the advice of the actor Satyrus, who advised him to recite with pebbles in his mouth, on the roughest and steepest places. To strengthen his voice he exercised himself in speaking aloud on the seashore, amidst the noise of the waves. At other times he shut himself up for months in a subterranean room, with his head half-shaved, that he might not be tempted to go out, and endeavored to acquire dignity of manner by practising before a mirror. He is also said to have transcribed the history of Thucydides eight times for the purpose of forming his style. After such a laborious preparation he composed and delivered his masterly speeches, of which his enemies said that they smelt of the lamp, but to which posterity has assigned the first rank among the models of eloquence—speeches in which he openly opposed the foolish wishes of the multitude, censured their faults, and inflamed their courage, their sense of honor, and their patriotism. He thundered against Philip of Macedon in his orations known as the Philippics, and instilled into his fellow-citizens the hatred which animated his own bosom. The first Philippic was delivered in 352 B.C., when Philip could no longer conceal his ambitious scheme of subjugating the whole of Greece. In 349 the city of Olynthus, the northern ally of Athens, was captured and destroyed by the Macedonians, and shortly afterward Philip took possession of the Pass of Thermopylæ. The orator insisted on the necessity of immediately preparing a fleet and an army; urging the Athenians to begin the war themselves; to make Macedonia the theatre, and to terminate it only by an advantageous treaty or a decisive battle. They admired and approved his plans, but did not execute them. The celebrated Phocion, who knew the weakness of Athens, unceasingly advised peace. Demosthenes went twice to the court of Philip to negotiate, but without success. On his return he recommended war, and endeavored to arm not only Athens, but all Greece. When Philip had finally penetrated into Phocis, through the Pass of Thermopylæ, and had taken possession of the city of Eletea (338), to the terror of Athens, Demosthenes obtained a decree of the people for fitting out a fleet of 200 vessels, marching an army to Eleusis, and sending ambassadors to all the cities of Greece, for the purpose of forming a universal confederacy against Philip. He was himself among the ambassadors, and prevailed on the Thebans to receive an Athenian army within their walls. He also exerted himself actively throughout Bœotia, and by his efforts a numerous army was collected to act against Philip. A battle was fought near Cheronea, and the Greeks were vanquished. Demosthenes fled, like thousands more. Nevertheless he was desirous of delivering a funeral oration over those who had fallen in battle. Æschines, his rival, did not fail to attack him on this account. The hostility between the two orators was the occasion of the speech 'De Corona' (on the crown), which resulted in the triumph of Demosthenes and the exile of his adversary. Philip having been soon after assassinated, Demosthenes endeavored to rouse Athens to regain her independence, but Alexander's dreadful chastisement of her ally Thebes filled the Athenians with such terror that they sued for mercy. It was with difficulty that Alexander could be persuaded to desist from his demand of the surrender of Demosthenes and some other orators; for the Macedonians feared Demosthenes more than they did the armies of Athens. He was afterward fined 50 talents on a charge of bribery, and being unable to pay the fine, was thrown into prison, from which he escaped and fled to Ægina, where he remained till the death of Alexander. Then followed the war with Antipater. Demosthenes again appeared in public, and endeavored to persuade the small Grecian states to unite against Macedonia. The Athenians received him with honor; but the war was unsuccessful, and Antipater insisted upon his being surrendered to him. Demosthenes fled to the Temple of Poseidon, in the island of Calauria, on the coast of Argolis, but finding himself not secure, he took poison, which he always carried about with him. He died, according to the general account, in 322 B.C., at the age of 60 or 62 years.

The character of Demosthenes is by most modern scholars considered almost spotless. Cicero pronounces him to be the most perfect of all orators. He always spoke as circumstances required, and was by turns calm, vehement, or elevated. He carried the Greek language to a degree of perfection which it never before had reached. In energy and power of persuasion, in penetration and power of reasoning, in the adaptation of the parts to the whole in beauty and vigor of expression, in strong and melodious language, he surpassed all his predecessors. Everything in his speeches is natural, vigorous, concise, symmetrical. This alone can explain his great influence over his contemporaries. We have under his name 61 orations, 56 exordiums, and 6 letters, some of which are not genuine. Among the oldest editions of the orations the best is that of Paris, 1570, in folio, with the commentaries of Ulpian. The first edition of his complete works, Greek and Latin, was edited by Hieronymus Wolf (Basel 1549). The edition by Bekker (Leipsic 1855) is considered among the best of the modern ones. See Schäfer, 'Demosthenes und seine Zeit.'

Demot'ic, or Enchorial, Alphabet, from the Greek *demos*, the people, is the name given by antiquarians to that alphabet which is used by the people, in contradistinction to an alphabet used by a certain class or caste; as, for instance, among the Egyptians the 7th century before Christ. We find on the famous Rosetta stone three inscriptions, one in hieroglyphics, one in demotic characters, and one in Greek. According to Champollion the demotic is a simplification of the hieratic, which again was a contraction of the hieroglyphic characters. According to Wilkinson the oldest inscriptions in demotic writing only date from the era of the Ptolemies. The hieroglyphic writing was a mixture of figurative, symbolic, and phonetic characters; the demotic for the most part is made up of the latter. See HIEROGLYPHICS.

Demot'icos, or Demotika, Turkey in Europe, a town in the province of Rumelia, on the Maritza, 20 miles south from Adrianople. The town has some silk, woolen, and earthenware manufactures. It is the see of a Greek archbishop, and is defended by a citadel, containing a palace, in which several of the Turkish sultans resided before they gained possession of Constantinople. Charles XII. remained here for some time after the disaster of Pultowa. Pop. 8,000.

Demp'ster, Charlotte Louisa Hawkins, Scottish novelist: b. Forfarshire, Scotland, 1835. She has been a frequent contributor to English periodicals. Her first book was 'The Hôtel du Petit St. Jean: a Gascon Story' (1869); the second, 'Véra' (1872), established her reputation. Her other works include: 'Essays' (1872); 'Iseulte' (1875); 'Blue Roses' (1877); 'Within Sound of the Sea' (1878), a Scottish story; 'Ninette' (1888), an idyl of Provence.

Dempster, Thomas, Scottish scholar: b. Cliftbog, Aberdeenshire, Scotland, 23 Aug. 1579; d. near Bologna, Italy, 6 Sept. 1625. In France, whither he went at an early period of his life, he represented himself as a man of family (assuming the title of Baron of Muiresk), and possessed of a good estate, which he had abandoned for his religion, the Roman Catholic. He was promoted to a professor's chair at Paris, in the College of Beauvais, and in his latest years was a professor at Bologna. Bayle says that though his business was only to teach a school, he was as ready to draw his sword as his pen, and as quarrelsome as if he had been a duelist by profession; scarcely a day passed, he adds, in which he did not fight either with his sword or at fisticuffs, so that he was the terror of all the schoolmasters.

Dempster's works are very numerous, and exhibit proofs of great erudition. Among them his 'Historia Ecclesiastica Gentis Scotorum' is the most remarkable, though, instead of being, as its title would indicate, an ecclesiastical history of Scotland, it is merely a list of Scottish authors and Scottish saints. His really most valuable work is 'De Etruria Regali,' an edition of which was published at Florence in 1725.

Demul'cents, remedies of a mucilaginous nature that are used in inflammatory conditions of the mucous membrane. They consist largely of mixtures of the oils, gums, and albumins. Thus sweet oil, acacia, tragacanth, marshmallow, slippery elm, white of egg, cream, milk, and flaxseed are all types of this class of remedies.

Demur'rage, in maritime law, is used to signify the amount to be paid by the charterer to the owner of a ship for detaining her in port longer than the time specified. The time of delay in port for a cargo, for convoy, etc., is usually stipulated in the charter-party, and also the allowance to be made in case of longer delay for those objects; and this time is sometimes specified in working days or lay days, as distinguished from holy days, when no cargo can be put on board. All ordinary cases of detention, such as port regulations, the overcrowded state of the harbor, and the like, or even from the unlawful acts of the custom-house officers, are at the freighter's risk, and demurrage must be paid although it is proved that the delay was not caused by any fault of his. But demurrage cannot be claimed when the ship is detained by a public enemy or by the hostile occupation of the port, nor if the detention is caused by the owner, master, or crew. The claim ceases whenever the vessel is cleared and ready for sailing, though she should be detained by adverse winds or rough weather.

Demur'rer, a pause or stop put to the proceedings of an action upon a point of difficulty, which must be determined by the court before any further proceedings can be had therein. He that demurs in law confesses the facts to be true, as stated by the opposite party, but denies that, by the law arising upon those facts, any injury is done to the party, or that he has made out a lawful excuse.

A general demurrer is one not specifying an objection, but relies on some defect in substance; a special demurrer specifies some particular defect in the form of the adversary's allegation.

Demy, dẹ-mī', a certain size of paper. In America a sheet of writing paper of the size 16 x 21 inches. English writing demy is 15 x 20 inches, while the printing paper there known as demy is 17½ x 22 inches.

Den (Anglo-Saxon, *denu*, a valley or woody ground) whenever added to the name of a place, denotes it to be in a valley or near timbered land. Used a great deal in Scotland.

Denain, dẹ-năn, France, town in the department of Nord, six miles from Valenciennes, on the left bank of the Scheldt, which is here navigable. It stands in the centre of a coal-field, and both coal and iron are extensively mined, and supply several blast-furnaces and other iron-works. Denain had once a celebrated abbey, founded in 764. A great victory was gained here in 1712 by the French under Villars over the allies under Eugene and Albemarle. Pop. 18,511.

Dena'rius, a Roman silver coin, the principal one under the republic and the empire, originally of the value of 10 asses or pounds of copper; but afterward of 16 asses, when the weight of the as was reduced to one ounce in 217 B.C. It was first minted in 269 or 268 B.C. when it weighed 72 grains. It was equivalent to about 16 or 17 cents of United States money. The obverse bore the helmeted head of Roma and the mark of its value X — that is, 10 asses; the reverse had Castor and Pollux upon it. Later other mythological and historical types were cast upon it. It continued to be the or-

dinary silver currency down to the age of the Emperor Septimius Severus and his sons, by whom pieces composed of a base alloy were introduced. The name was also given to gold coin struck during the empire; its full title was *denarius aureus*, and it was generally called *aureus*, but by Pliny uniformly *denarius*. It passed for 25 silver *denarii*. Diocletian in 290 A.D. gave the name *denarius* to a coin of copper issued by him. The *denarius* of Tiberius is the penny mentioned in the New Testament.

Denbigh, dĕn'bĭ, Wales. (1) A maritime county, area, 425,038 acres. Its surface, minerals, and productions are as in other parts of Wales. Pop. 129,935. (2) A municipal and parliamentary borough, capital of the county of Denbigh. Pop. 6,439.

Denby, Charles, American diplomatist: b. Mount Doy, Va., 1830; d. Evansville, Ind., 13 Jan. 1904. He was educated at Georgetown University and Virginia Military Institute and became a lawyer. Having served through the Civil War and attained the rank of colonel, he resumed the practice of law. He was appointed minister to China in 1885 and served for 13 years in Peking. In 1898 he was made a member of the commission to investigate the conduct of the war with Spain, and in 1899 a member of the Philippine Commission. During the war between China and Japan the Japanese government placed its interests in China in his care.

Denderah, dĕn'dĕr-ą, Egypt (the Tentyra of the Greeks and Romans), a village on the left bank of the Nile; lat. 26° 10′ N.; lon. 32° 40′ E.; celebrated for its temple, one of the most magnificent and best preserved remains of antiquity in Egypt, begun under Ptolemy XI. and completed in the reign of the Emperor Tiberius. It was dedicated to the goddess Athor or Aphrodite, and is enclosed within a wall built of sun-dried bricks, in some parts 35 feet high and 15 feet thick. The portico of the temple consists of 24 columns, in three rows four deep on either side, each above 22 feet in circumference, and 50 feet high. The interior consists of a number of apartments, all the walls and ceilings of which are covered with religious and astronomical representations, including the figure of Athor. The roofs are flat, and are formed of oblong masses of stone resting on the side walls, or on rows of columns carried down the middle of the building, and whose capitals are richly ornamented with the budding lotus. The only light admitted to the interior was by small perpendicular holes cut in the ceiling, or by oblique apertures in the sides. The hieroglyphics and ornamentation of the temple belong to the declining period of Egyptian art. The effect of the portico is greatly heightened by the fact of its roof being retained; and on the ceiling is the famous zodiac, at one time regarded as of great antiquity. Another remarkable object belonging to the temple, and which excited the greatest interest, was a celestial planisphere or zodiac, forming the ceiling of one of the upper chambers. This was carefully removed from its original place in 1822, and conveyed to Paris.

Dendermonde, dĕn-dĕr-mŏn'dĕ, or **Termonde**, Belgium, town in the province of East Flanders, at the junction of the Dender and the Scheldt rivers, 12 miles northwest from Brussels. It is strongly fortified, defended by a citadel, and surrounded by low, marshy ground which can be laid under water. It contains manufactories of woolen and linen goods, tobacco, and other articles. It is an important railroad centre. It possesses a college, a public library, an academy of design and architecture, a music school, a number of paintings by Van Dyke and De Crayer, and a remarkably decorated ancient town-hall. Pop. 10,000.

Dendrerpeton, dĕn-drĕr'pĕ-tŏn, a small lizard-like reptile, discovered by Dawson and Lyell in Nova Scotia; so named from its being found in the interior of a fossil trunk, and hence supposed to have been of arboreal habits. It is now regarded as a labyrinthodont, and is ranked by some scientists under the tribe *Microsauria*.

Den'drite (Gr. "tree-like"), any mineral in which arborescent forms resembling trees or mosses occur. These peculiar markings, which are often of great delicacy and beauty, are commonly due to the presence of certain metallic oxides which have separated from the general mass of the mineral. Moss agate is a familiar example of a dendrite, the markings in this case being due to the presence of oxide of manganese. The name "dendrite" is also applied to the complex, tree-like crystalline growths often observed in the case of silver, lead, copper, and certain other metals.

Dendro'bium, an extensive genus of epiphytes belonging to the order *Orchidaceæ*, natives of India, where they are found in great numbers in the damp tropical forests. About 200 species are known, of which 80 are cultivated in hothouses. The genus varies greatly in the character of its bloom, some of the species being among the finest of the epiphytes. Among this class are *D. nobilis, D. chrysanthemum, D. gibsoni*, and *D. densiflorum*.

Dendrol'agus, a genus of marsupial animals, popularly known as tree-kangaroos, from their habit of living in trees. Their fore legs are not much shorter than the hind ones. Four species are known, one of them (*D. lumholtzi*) being a native of northern Queensland, and the other three (*D. ursinus, inustus*, and *dorianus*) natives of the island of New Guinea.

Den'dropbis, a genus of snakes, family *Dendrophidæ*, with smooth scales, which are much larger along the back than on the sides; the sides of the abdomen are slightly keeled. This genus occurs in India, the East Indies, and Australia, and its members are not venomous.

Dengue (dĕn gā) **Fever** (also called dandy, breakbone, and three-days' fever, scarlatina rheumatica, abu rokab), a specific disease usually distinguished by an acute onset with fever, intense muscular and joint pains, and later by a measle-like eruption. In some countries it is endemic and has three times assumed pandemic proportions. It is found in Eastern countries — Arabia, China, India, Africa, especially in Egypt and Zanzibar. It has been found in Spain, Greece, and Asia Minor; in Bermuda, the West Indies, the southern United States; in parts of South America; and in Sydney and Brisbane, Australia. It is essentially a disease of the tropics, where it is usually found in hot weather, in the coast and river districts and low levels more than in inland parts; and it would

seem to be a communicable disease, depending upon some micro-organism. As a rule the disease lasts from four to eight days, and the prognosis is favorable. It is frequently confounded with influenza, yellow fever, rheumatism, measles, scarlet fever. Treatment is by means of quinine, ice, the newer antipyretics, and opium. Consult: 'Encyclopedia Medica' (Vol. II.); Manson, in Albutt's 'System of Medicine' (Vol. II.).

Denham, Dixon, English explorer: b. London 1780; d. Sierra Leone 9 June 1828. In 1823–4 he was engaged, in company with Capt. Clapperton and Dr. Oudney, in exploring the central regions of Africa. His courage, address, firmness, perseverance, and moderation, his bold, frank, energetic disposition, and his conciliating manners, peculiarly fitted him for such an undertaking. The account of the expedition was prepared by Denham, and published under the title 'Narrative of Travels and Discoveries in Northern and Central Africa' (1826). In 1826 he went to Sierra Leone as superintendent of the liberated Africans, and in 1828 was appointed lieutenant-governor of the colony.

Denham, Sir John, English poet: b. Dublin, Ireland, 1615; d. London March 1669. He was the son of Sir John Denham, chief baron of the exchequer in Ireland, and was educated in London and at Oxford. In 1641 he first became known by his tragedy of 'The Sophy.' This piece was so much admired that Waller observed, "Denham had broken out like the Irish rebellion, 60,000 strong, when no person suspected it." In 1643, he published the first edition of his most celebrated poem, called 'Cooper's Hill.' Among the last and best of his productions is a poem in which he commemorated the death of Cowley. His poetry generally is remarkable for its rhythmic flow and smoothness, leading up sometimes to passages of force and dignity.

Den'hart, or **Denhardt, Clemens** and **Gustave,** German explorers: b. Zeitz 1852 and 1856, respectively. They made a tour in 1878, through the Tana River region, East Africa, to establish German trade, and another from the Island of Lamu to Vitu in March 1885, the sultan of the Swahile desiring a treaty with Germany. Clemens Denhart transferred part of the territory acquired by him to the German Colonist Society, the Deutsche Witugesellschaft. All rights to this territory were ceded by Germany to England in 1890, in exchange for the island of Helgoland, the brothers receiving an indemnity of 150,000 marks from the German government.

Denina, Carlo Giovanni Maria, kär'lō jō-vän'nē mä-rē'ä dä-nē'nä, Italian historian: b. Revello, Piedmont, 28 Feb. 1731; d. Paris 5 Dec. 1813. He studied at Turin, in 1758 became an extraordinary professor in the university there, and in 1770 full professor. In 1760 he published the first three volumes of his 'History of the Italian Revolutions,' his most important work. He went to Berlin in 1782, and was appointed a member of the Academy. He published 'La Prusse littéraire sous Frédéric II.'; 'Political and Literary History of Greece'; and 'Letters from Brandenburg'; etc. His 'Clef des Langues,' dedicated to Napoleon, brought him the position of librarian to the emperor.

Deni'o, Hiram, American jurist: b. Rome, N. Y., 21 May 1799; d. Utica 5 Nov. 1834. He studied law, was admitted to the bar, and practised at Rome and Utica. He was appointed circuit judge of the Fifth New York circuit, and was three times elected judge of the State court of appeals, the first time in 1853. He retired from that office in 1866. He edited with William Tracy 'Revised Statutes' of New York (1852), and published 'Reports of Cases Argued and Determined in the Supreme Court and in the Court for the Correction of Errors' (5 vols. 1845–8).

Denis, Fr. dė-nē, or **Denys, Saint, or Dionysius, Saint,** first bishop of Paris, and patron saint of the French nation. Exact information regarding Saint Denis cannot be obtained, but there is no doubt he belongs to the 3d century. In the Middle Ages it was believed by many that Saint Denis, or Dionysius, of Paris was the same as the Dionysius converted at Athens by Saint Paul; but the number of years intervening between the time of Saint Paul and when Saint Denis was bishop of Paris (about 207 years) is proof that the Areopagite of Athens and the apostle of Paris were not the same person.

The most reliable authorities say that Saint Denis of Paris was sent by the Pope to Gaul about 250 A.D. His mission was most successful and many pagans were converted to Christianity. The number of his disciples attracted the attention of the Roman governor who caused the arrest of Denis and several of his companions, among whom were Eleutherius, a deacon, and Rusticus, a priest. The Christians, refusing to denounce Christ and offer sacrifice to the gods, were tortured and put to death. The bodies of Denis, the priest, and the deacon were thrown into the Seine. Catulla, a Christian woman, recovered the bodies and gave them burial. Later a church was built over the place where the bodies were interred. Dagobert I. built (about 636) here the Abbey of Saint Denis. His feast, in the calendar of the Roman Catholic Church, is 9 October. Consult: Butler, 'Lives of Saints'; Taillar, 'Apostolate of Saint Denis'; Vereilly, 'Vie de Saint Denis.'

Denis, St., săñ dė-nē, France, town in the department of the Seine, six miles north of Paris, lying within the lines of forts surrounding the capital. It has numerous manufactories of calicoes and other printed cotton goods, gelatine, candles, saltpetre, and soda. In the latter part of the 3d century a chapel was erected on or near the present site to the memory of St. Dionysius or Denis, who is said to have been martyred here. For this chapel Dagobert I., in the 7th century, substituted a large basilica, in which he himself was interred, and afterward it was used as the burial place of the kings of France. Changes were made later but under the Abbot Suger the building became most beautiful. The chapel was destroyed during the Revolution and the bodies of the kings put into a cannon pit. Many of the tombs and relics were, however, preserved in the Musée des Petits Augustins. Napoleon's decree of 20 February 1806 made St. Denis again the burial place of the reigning family of France. Louis XVIII. obliterated from St. Denis all traces of Napoleon's rule; but under Napoleon III. the famous architect Viollet-le-Duc effected a mag-

nificent restoration of the ancient building. The present stained glass windows are all modern but one. Pop. 53,053.

Denison, Charles Wheeler, American poet and prose writer: b. New London, Conn., 11 Nov. 1809; d. 14 Nov. 1881. He published: 'The American Village and Other Poems' (1845); 'Out at Sea,' poems (1867); 'The Child Hunters' (1867); and a series of biographies: 'The Tanner Boy' (Grant); 'Winfield the Lawyer's Son' (Hancock); etc.

Denison, Frederic, American clergyman: b. Stonington, Conn., 28 Sept. 1819; d. Providence, R. I., 16 Aug. 1901. He was graduated from Brown in 1847; was chaplain in the Union army during the Civil War, and held several pastorates. He has written: 'The Supper Institution'; 'The Sabbath Institution'; 'Notes of the Baptists and Their Principles in Norwich, Conn.'; 'Westerly and Its Witnesses'; 'History of the First Rhode Island Cavalry'; 'Picturesque Rhode Island.'

Denison, George Taylor, Canadian soldier: b. Toronto 31 Aug. 1839. He was educated at Upper Canada College and Toronto University, was called to the bar in 1861, and practised law in Toronto, in 1877 being appointed police magistrate of the city. In 1872 and 1873 he was sent to England as commissioner in behalf of immigration. He began his military service in 1855 and was made lieutenant-colonel in 1866; he was in active service in the Fenian raid of 1866 and in the Riel rebellion in the Northwest Territory in 1885. His 'History of Cavalry' (1877) won the first prize offered by the emperor of Russia for the best book on the subject; he has written also: 'The National Defenses' (1861); 'Canada, Is She Prepared for War?' (1861); 'The Fenian Raid at Fort Erie' (1866); and 'Canada and Her Relations to the Empire' (1895). He was one of the founders of the "Canada First" party, and through his contributions to periodical literature and public addresses has been known as an earnest advocate of Canada's rights and of the preservation of the unity of the empire.

Denison, John Evelyn, English politician, for 14 years speaker of the British House of Commons: b. Ossington, Nottinghamshire, 27 Jan. 1800; d. 7 March 1873. Educated at Eton and Christ Church, Oxford, he entered Parliament in 1823, and was a lord of the Admiralty 1827–8. In 1872 he retired from the speaker's chair, and shortly after was created Viscount Ossington. He was a D.C.L. of Oxford; and it was on his suggestion that the "Speaker's Commentary" to the Bible was undertaken.

Denison, John Henry, American Congregational clergyman: b. Boston, Mass., 3 March 1841. He was college pastor at Williamstown for five years, and is the author of 'Christ's Idea of the Supernatural' (1895).

Denison, John Ledyard, American writer: b. Stonington, Conn., 19 Sept. 1826. He has published: 'Pictorial History of the Wars of the United States' (1850); 'Illustrated History of the New World' (1872); 'Pictorial History of the Navy of the United States' (1860).

Denison, Mary Andrews, American author: b. Cambridge, Mass., 26 May 1826. She married Charles Wheeler Denison (q.v.) in 1846 and became connected with the 'Olive Branch' of which he was on the editorial staff. Contributing frequently to the American and later to the English magazines, she wrote sketches of native life while living in British Guiana, where her husband was American consul. Among her numerous works are: 'Home Pictures' (1853); 'Gracie Amber' (1857); 'Old Hepsey, a Tale of the South' (1858); 'Opposite the Jail' (1858); 'The Lover's Trials' (1865); 'Annie and Teely' (1866); 'That Husband of Mine' (1874), which sold more than 200,000 copies in a short time; 'That Wife of Mine' (1877); 'Rothmell' (1879); 'Mr. Peter Crewelt' (1878); 'His Triumph' (1883); 'What One Boy Can Do' (1885). She has also written many Sunday-school books.

Denison, Iowa, city, county-seat of Crawford County; on the Boyer River, and on the Chicago & N., and the Illinois C. R.R.'s; about 100 miles west by north of Des Moines. Flouring mills and creameries are the chief manufactories. It is the site of one of the Denison Normal and Business schools, a private institution. Pop. (1900) 2,771.

Denison, Texas, city in Grayson County, on the Missouri, K. & T., the Houston & T. C., and the Texas & P. R.R.'s; 106 miles north of Dallas. It is a noted cattle-shipping place; the trade centre of the surrounding agricultural country, including the Indian Territory; and an important railroad point. It has manufactories of cotton, iron, and machinery, daily and weekly papers, high school, electric lights, waterworks, two national banks, St. Francis Xavier's Academy, and the Washington School. It was settled in 1872 and is now governed under a charter of 1893. Pop. (1902) 12,986.

Denison University, an educational institution in Granville, Ohio; founded in 1831, under the auspices of the Baptist Church, and intended at first as a manual training school. The manual training was soon abandoned, and the theological department was dropped in 1870. The Shepardson College for Women, established in 1887, became affiliated with the university in 1900. In 1902 the library contained about 22,000 volumes, and the attendance was 500.

Denitrifica'tion. See NITRIFICATION.

Den'izen, in English law, an alien who by letters patent has been constituted a British subject permanently or for a time. A denizen is in a middle state between an alien and a natural born or naturalized subject. He may take lands by purchase, or derive a title by descent through his parents or any ancestor, though they be aliens. No denizen can sit in Parliament, or take office, civil or military.— In natural history, an animal or plant originally introduced into a country or district by human agency, which now maintains itself there without the direct aid of man, is called a denizen of that country or district.

Den'man, Thomas, BARON, English jurist: b. London 23 Feb. 1779; d. 22 Sept. 1851. He was associated with Brougham in the courageous defense of Queen Caroline (1820), and shared his consequent popularity. He sat in Parliament in 1818–26, and was attorney-general in Earl Grey's administration in 1830–2; succeeded Lord Tenterden as lord chief justice of England in 1832; and was raised to the peerage in 1834. He retired from the bench in 1850.

Denmark (Danish, *Danmark*), a northern kingdom of Europe, between lat. 54° 40′ and 57° 45′ N., and lon. 8° 4′ and 12° 45′ E. It is composed of a peninsular portion, and an extensive archipelago, lying east of it, with a few scattered islands on its west side; and is bounded north by the Skager Rack, which separates it from Norway; northeast and east by the Cattegat and Sound, which separate it from Sweden; east and south by the Baltic; south by the duchy of Sleswick; and west by the German Ocean or North Sea. The peninsular portion is composed of Jutland, and measures, north to south, 185 miles with a breadth varying from 40 to 108 miles — its broadest part being from Fornæs Point, lat. 56° 26′ 42″ N., on the east coast, to Nissum Fiord on the west coast. The numerous islands lying east of Jutland are mainly comprised in two groups: — first, that of Själland, Seeland or Zealand, including, besides the large island of that name, the small adjoining islands east of the Great Belt, the principal of which are Amager, Langöe, Taröe, Masnedöe, Agersöe, Lolland or Laaland, Falster, and Möen, and second, the Fünen or Fyen group, comprising, besides the large island of that name, the neighboring islands west of the Great Belt, including Langeland, Aeröe, Fanöe, Taasinge, and others. Besides these, there are the outlying islands of Lessöe and Anholt, in the Cattegat, and Bornholm in the Baltic.

Besides these territories, Denmark possesses the Färöe Islands and Iceland, in the North Atlantic Ocean; Greenland, in the Arctic regions; the islands of Santa Cruz or Saint Croix, Saint Thomas, and Saint John, in the West Indies. She also formerly had some establishments on the coasts of Guinea, in Africa, and of Coromandel, in India; but these have been sold to Great Britain.

For administrative purposes Denmark is divided into 18 counties (*Amter*), each county being subdivided into *Herreder* or hundreds. Copenhagen is the capital, and among the towns of importance are Aarhuus, Odensee, and Aalborg.

The following table gives the main divisions of the country, with their area and population, as well as the total area and population of the whole monarchy, according to the census of 1 Feb. 1901:

Divisions	Area English sq. m.	Population 1901
City of Copenhagen (Kjöbenhavn) without suburbs	21	378,235
Islands in the Baltic	5,062	1,007,513
Peninsula of Jutland	9,765	1,063,792
Färöe Islands (17 inhabited)	512	15,230
Total	15,360	2,464,770

Previous to 1864 the duchies of Schleswig-Holstein and Lauenburg belonged to Denmark, so that the area of the kingdom was then greater by about 7,360 square miles, the corresponding population being more than a million.

Geology and General Aspect.—Denmark is a very low-lying country, there being no elevation of any consequence throughout the whole kingdom. The greatest height is attained on the eastern side of the peninsula, though even there it never exceeds 550 feet. In respect of geological structure all the rocks belong to the upper series of the Secondary, and to the Tertiary formation, and have been deposited from water in regular strata. The rock most fully developed is the chalk, of which several distinct species have been recognized. The whole west coast is rendered almost uninhabitable by the drift-sand, which has formed an almost uninterrupted line of sterile downs, called *Klitten*, extending from Cape Skagen to Blaavands Hook, a distance of nearly 200 miles. Along parts of the coast of Jutland are extensive flats or plains, which have been wrested from the sea, and which are protected from its encroachments by huge dykes, as in Holland.

Rivers, Lakes, Sea-arms, Ports, etc.—Denmark has no large rivers; the principal is the Guden, which is navigable for part of its course. Less important streams are the Holm, the Lönborg, and the Stor Aa. All the others are insignificant streams. There are no rivers in any of the islands, but brooks and streamlets abound. There are a number of lakes, particularly in Jutland, and several in the larger islands; but they are all small. The most remarkable of the physical features of Denmark are its lagoons or fiords, winding inlets of the sea, that penetrate far into the land. The largest of these is the Lymfiord, or Liim Fiord, in Jutland, which, entering the land in the Cattegat, winds its way quite through the peninsula, and is separated from the North Sea merely by a narrow strip of land which storms have ruptured in one or two places. Most of the streams, lakes, and coasts of the kingdom are well stocked with fish. Besides these inland seas, the Great Belt separates the large islands of Seeland and Fünen, and the Little Belt flows between the latter and the coast of Jutland and Schleswig. Denmark is well supplied with excellent seaports, the most important being Copenhagen, Aalborg, Aarhuus, and Randers.

Climate.—The prevailing characteristic of the climate of Denmark is humidity; it is also remarkably temperate for so northerly a region; both the result of the lowness of the land and of its proximity to the sea on all sides. The heats of summer are great, sometimes excessive. The mean temperature of the year is 47°. The shortest day is about 6½ hours, the longest 17½ hours.

Animal and Vegetable Products.—Horses and cattle are reared in great numbers, and both are excellent. Large flocks of sheep are kept; but rather for the flesh than the wool, which is coarse and short. Swine are also reared to a great extent. Deer, stags, roes, hares, and a variety of other game are met with in the royal and other forests, but do not abound anywhere else. Wild fowl — including the eider-duck, so famous for its down — are numerous. Poultry of all kinds are raised, particularly geese. Potatoes, barley, oats, rye, beans, pease, tares, flax, hemp, madder, and tobacco are raised; wheat in Laaland and buckwheat in Fünen. Among the garden fruits are apples, plums, cherries, pears, and nuts. Few of the great forests with which the country was once covered now remain. Government, however, has of late years paid some attention to this source of national wealth, and has taken measures for the protection and better management of the forests. The larger forests are now confined to the east side of Jutland and to Seeland.

Agriculture, Cattle Breeding, etc.—Although not particularly favored by nature, Denmark is

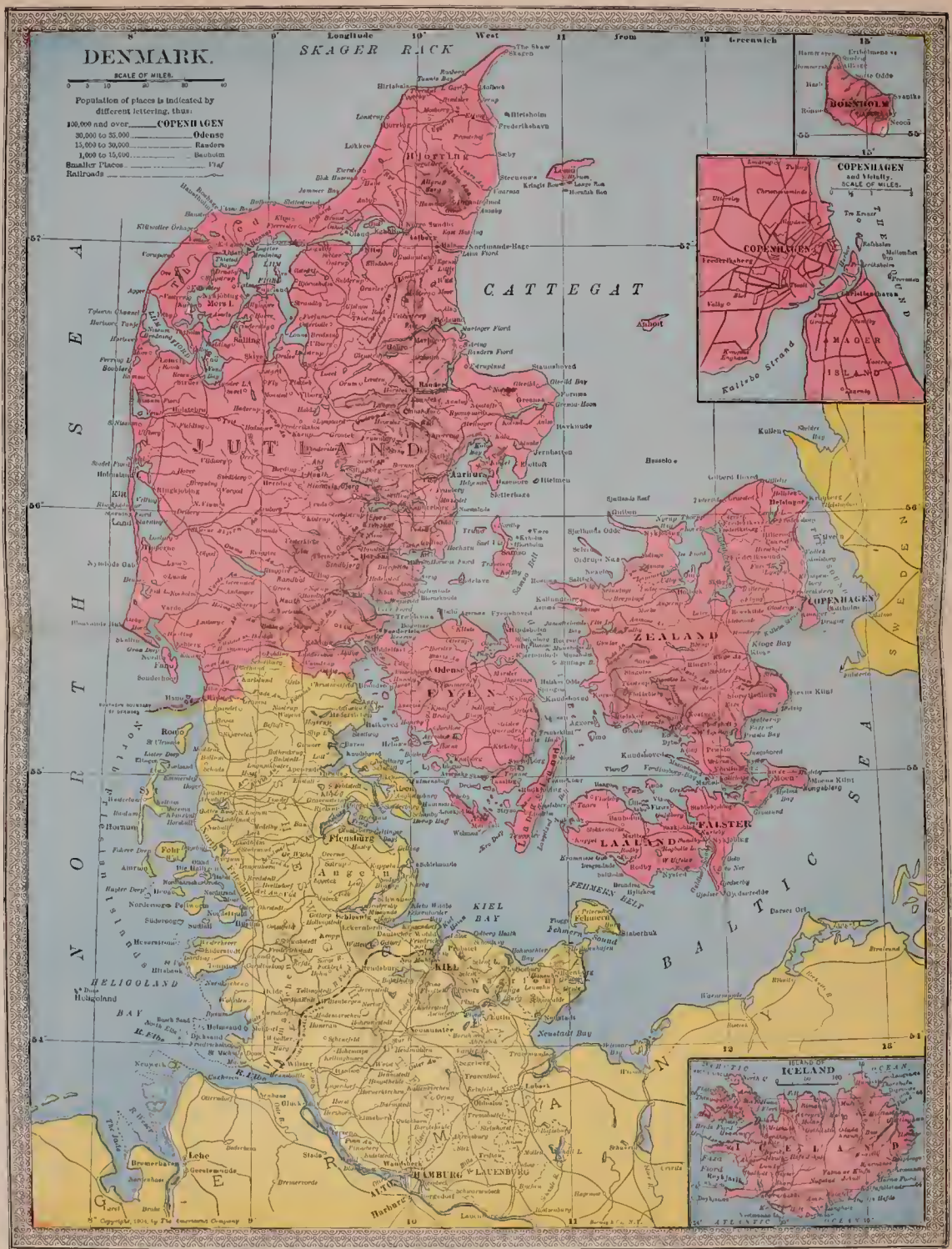
yet pre-eminently an agricultural country. Of the total area 80 per cent is productive; about one sixth of the unproductive area is bog. The land is greatly subdivided, as the law interdicts the union of small farms into larger, and encourages the division of landed property. The kinds of grain most largely cultivated are barley, oats, rye, and wheat, the greatest area being occupied by oats, the second by barley. Rye is grown throughout the whole peninsula, and in the islands of Funen and Seeland, and some of the islands on the west coast. From this grain the greater part of the bread used in Denmark is made. Wheat, which occupies but a comparatively small area, is grown chiefly on the islands of Laaland and Langeland, and on large estates in other quarters of the kingdom. The yearly yield of the cereal crop is said to be larger than that raised by any corresponding European population except that of Mecklenburg. The oats crop of 1898 amounted to 39,920,052, the barley crop to 21,048,504, that of rye to 15,528,240, and that of wheat to 2,878,120 bushels. The value of these crops was estimated at $48,856,830, the total value for all crops for that year being $91,091,910. Buckwheat is cultivated to some extent in Jutland, as also in the island of Fünen and elsewhere. Potatoes, which were introduced into Denmark early in the 19th century, are now very generally cultivated. Herbage plants and grass are carefully cultivated. Beans, pease, and tares are also extensively cultivated throughout the whole country and form an important article of food. Flax, hemp, hops, tobacco, madder, lavender, and mustard-seed are grown, but not in sufficient quantities to supply the home demand. The part of the kingdom best adapted for the production of fruit is the island of Fünen. Cattle-breeding, grazing, and the dairy engage the greatest share of the farmer's attention in Denmark. Large and increasing numbers of cattle are annually exported from the country. A great increase has of late years taken place also in dairy produce, and the export of butter is now the main source of the wealth of Denmark. The rearing of horses is extensively carried on. The old Danish breed is found chiefly in Jutland. Those from the islands are said to be of Tartar descent, and are small, but strong and active. Sheep-rearing is on the decline in Denmark. Eggs are now largely exported, and the rearing of hogs is much attended to; the greatest number are reared in the vicinity of the woods in East Jutland. The rearing of bees occupies a large share of attention, particularly in the island of Funen, and wax is largely exported.

Fisheries.—The fisheries are an important branch of national industry. Next to the herring the turbot, torsk, and salmon are the most abundant sorts of fish. Oyster banks occur on the east coast of Jutland, near its northern extremity, and near the island of Lessöe. Fish-ponds were at one time very general over the country, and were profitable. The seal fisheries of Denmark are considerable, the principal station being the island of Anholt.

Manufactures.—These are comparatively insignificant, and do not comprise any peculiar or national manufacture. There are, however, one or two articles which have attained a considerable reputation; these are the woolens and earthenware of Jutland, the former a domestic manufacture; the wooden clocks of Bornholm, and a superior kind of stove made in Copenhagen. The manufacture of paper is pretty extensive, and has of late years been greatly improved and extended. There are also iron-foundries, sugar-refineries, some extensive tanneries, and many distilleries. Randers in Jutland, and Odensee in the island of Funen, were formerly celebrated for the manufacture of gloves; but the peculiar kind of leather from which they were made, and in which their excellence consisted, is now prepared in other countries. The people of Denmark bake their own bread, brew their own beer, and spin the greatest portion of the woolen yarn afterward knitted into stockings or woven into cloth by the village weaver. The women make up their own dresses, and frequently the clothes of their husbands; the latter make the wooden shoes and slippers, and manufacture the greater part of the house furniture and farming utensils. Several of the manufacturing establishments of Denmark belong to the government. Among these establishments are a royal porcelain manufactory in Copenhagen, and a royal cloth manufactory in Irsseröd, which supplies cloth for the army.

Commerce, Canals and Railways.—The commerce of Denmark is carried on chiefly with Great Britain, Germany (especially Sleswick-Holstein), Norway, Sweden, and Russia, Great Britain and Germany possessing by far the largest share. The chief imports are textile goods (especially cottons), metals and hardware, wood and articles made of it, coal, bricks, salt, manure, oil, oil-cake, fish, rice, coffee, fruit, glass-ware, paper. The principal imports are cotton manufactures, coal, and iron. Considerable quantities of cottons are imported by Denmark from Germany. The manufactures of Denmark being, as already mentioned, insignificant, the articles exported consist chiefly of agricultural products. The declared value of the total imports in 1876 amounted to $63,583,790, and that of the exports to $50,185,285; in 1898 they were $126,386,115 and $89,602,770 respectively. In 1898 the mercantile marine of Denmark consisted of 3,696 vessels, with a total tonnage of 350,108 tons. The coasting trade is extensive, and is largely shared in by foreigners. There are several canals in Denmark, but none of them of any great consequence. The country is now pretty well supplied with railroads, there being lines running across the islands of Seeland, Funen, Laaland, and Falster, which, assisted by ferries, gives direct communication with the capital on the one hand and with Jutland on the other.

Moneys, Weights, etc.—Since 1 Jan. 1875, the unit of the Danish monetary system has been the *krona* or crown, equal to about 28 cents. The krona is divided into 100 *öre*. The commercial pound weight is heavier than the United States weight of that denomination, 100 pounds Danish being equal to 110¼ pounds avoirdupois. The weight of 100 pounds Danish is known as the *centner*. The principal measure used throughout Denmark for corn is the barrel or toende, which contains 7,776 Danish cubic inches or 8,488 English cubic inches, and consequently is equal to nearly four bushels. The *viertel*, used for wine and liquor, is equal to 1.7 gallon. The standard measure of length is the foot, which equals 12.356 inches. The Danish mile is 4.684 English miles. 16 Danish square feet are nearly equal to 17 English square feet. A tonne or toende of land is as much land as can be



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sown with one toende of rye, one of barley, or two of oats, and is equal to 1.36 acres.

People, Education, Religion.—The population of Denmark is composed almost exclusively of Danes, with a few thousand Jews and others. The Danes have regular and well-formed features, fair or brownish hair, and blue eyes, with muscular frames; they are kind-hearted, honest, and simple-minded, and continue to maintain their ancient reputation of being bold and hardy seamen. All classes are noted for their hospitality, which is indeed a characteristic of the nation. At the head of the educational institutions stand the University of Copenhagen and the Holberg Academy at Soröe. Elementary education is widely diffused, although in this regard Denmark is no longer so pre-eminent as formerly; it is compulsory for children between the ages of 7 and 14 years, poor parents paying only a nominal sum toward the government or parochial schools, of which there are about 3,000. There are training colleges for teachers, and classical and other higher education is afforded by a large number of colleges in the more important towns, with the university of Copenhagen (1,300 students) for the centre of the entire system. Denmark has also a theological seminary, a royal surgical college, a veterinary and agricultural school, and numerous military, technical and commercial schools, while 50 "people's high schools" provide instruction in agricultural subjects. There are three public libraries in Copenhagen, of which the Royal Library, with 500,000 volumes, is especially rich in Oriental and Icelandic MSS. The established religion is Lutheran, to which the king must belong; but complete toleration is enjoyed in every part of the kingdom. The Reformation was introduced in 1536, when the Church revenues were seized by the crown. Denmark is divided into seven dioceses, in which there are 1,360 parishes. There are only 31,000 persons not belonging to the Lutheran Church, of whom 4,000 are Jews, 3,600 Roman Catholics, 2,300 Methodists, 1,000 Mormons 4,600 Baptists, and 2,600 Irvingites.

Government, Army and Navy, Finance.— The government of Denmark is a constitutional monarchy, the king being assisted by a cabinet of seven ministers. The crown was elective until 1660, when the people and clergy, impelled by hatred toward the nobles, invested the sovereign (Frederick III.) with absolute power, and declared the succession to the throne hereditary. From that time the crown exercised absolute rule till 1831, when a constitution was granted. This proving unsatisfactory, was superseded in 1848 by the form of government which, with some alterations, Denmark now enjoys. The national assembly or Rigsdag consists of the Folkething and Landsthing, which meet annually, the members receiving a fixed allowance during their sittings. The Landsthing is composed of 66 members, of whom 12 are nominated for life by the king, while the remainder are elected for a term of eight years by certain bodies representing the large taxpayers of the kingdom. The members of the Folkething, whose number is fixed by statute in the proportion of one to every 16,000 of the population, are elected for three years by practically universal suffrage. To this body all budgets must first be submitted; but in the years 1877–87, when the government had a minority in the lower house, the king was induced to give the royal ratification to successive "provisionary budgets," which had never received the assent of the Rigsdag. Nevertheless the financial condition of Denmark is sound and prosperous. The total revenue in the period 1885–95 fluctuated from $15,000,000 to $16,000,000 a year; while the expenditure has repeatedly exceeded $18,000,000. Since the war of 1866, the government has maintained a comparatively large reserve fund to meet any sudden emergency. That fund stood in 1887 at $4,950,000. The total national debt is over $50,000,000, or about $25 per head of the population; but as the investments of the state (in telegraphs, etc.) amount to nearly $25,000,000, this proportion is reduced to less than $15. The decimal system was introduced in 1875, the unit being the *krone*, or crown, of 100 *öre;* the average rate of exchange is 3.6 *kroner* to the dollar. The Danish army numbers 1,200 officers and 46,000 men, inclusive of the landwehr; but only a sufficient establishment for garrison purposes is maintained, and the peace strength is 750 officers and 13,000 men. The total war strength is about 50,000 men, to which an extra reserve of 14,000 could be added on emergency. Conscription prevails, and the period of military service is divided into eight years in the line and reserve, and eight in the extra reserve. The navy is recruited by levies from the coast districts. The fleet comprises some 40 steamers (of which 10 are ironclads, but only one a first-class battleship). The navy numbered in 1888, 134 officers and 1,477 men. There were in 1897, 290 officers and 1,150 men. Besides Copenhagen (q.v.), there are no defensible fortresses, though there are antiquated forts at Helsingör (Elsinore) and Fredericia. The arsenal is at Copenhagen.

History.—The early history of Denmark is lost in the twilight of the saga-period, out of which loom dimly the figures of its heroes, their brave deeds, and daring voyages. Within its borders the Celts had first their home, and from its shores the Angles and Saxons sailed in the 5th century to the conquest of England; while in their place the Danes from Zealand settled on the deserted lands, extending their sway as far south as the Eider. One of their earliest kings, Harald Hildetand, fell in battle against the Swedes in 695; and shortly afterward a branch of the Ynglinger occupied Jutland, where they held a footing for two centuries. One of their kings, Harald Klak, received baptism in 826 from Ansgar, but the introduction of Christianity did not at once place any check on the long accustomed inroads on Frankish territory, or on the piratical expeditions of the Vikings; although the country was soon torn by dissensions between the adherents of the old and new faiths. Gorm the Old, who drove the Ynglinger from the peninsula, and first united the mainland and islands under one rule, was the bitter enemy of Christianity; and although his death in 936 gave fresh vigor to the diffusion of the new faith, yet even its ultimate success was only insured by the zealous support it received from Gorm's grandson, Canute. On his death in 1035 the three kingdoms of his Anglo-Scandinavian empire separated, and his sister's son, Svend Estridsen (1047–76), ascended the throne of Denmark, founding a princely line that flourished 400 years. Internal dissensions and external wars weakened the country, and the introduction of a feudal system raised up a powerful nobility,

and ground down the once free people to a condition of serfdom. Waldemar I. (1157–82) added Rugen to the other Wendish districts of Mecklenburg and Pomerania, and extended his sway over Norway also. Under Waldemar II. the conquests of Denmark extended so far into German and Wendish lands, that the Baltic was little more than an inland Danish sea. The jealousy of the German princes and the treachery of his vassals combined to rob him, however, of these brilliant conquests, and his death in 1241 was followed by a century of anarchy and inglorious decadence of the authority of the crown, during which the kingdom was brought to the brink of annihilation. Under his great-grandson, Waldemar IV., Denmark made a transient recovery of the conquests of the older Waldemars, rousing the jealousy of the Hanseatic League, and the national laws were codified. From his death in 1375 to 1412, his daughter, the great Margaret, widow of Hakon VI. of Norway, ruled not only that country and Denmark, but in course of time Sweden also, with so light yet firm a hand that for once in the course of their history the three rival Scandinavian kingdoms were content to act in harmony. Margaret's successor, Eric, the son of her niece, for whose sake she had striven to give permanence, by the act known as the Union of Calmar (1397), to the amalgamation of the three sovereignties into one, undid her glorious work with fatal rapidity, lost the allegiance and the crowns of his triple kingdom, and ended his disastrous existence in misery and obscurity. After the short reign of his nephew, Christopher of Bavaria (1440–8), the Danes exerted their ancient right of election to the throne, and chose for their king Christian of Oldenburg, a descendant of the old royal family through his maternal ancestress, Rikissa, the great-granddaughter of Waldemar II. Christian I. (1448–81), who was at the same time elected Duke of Sleswick and Holstein, was the founder of the Oldenburg line, which continued unbroken till the death of Frederick VII. in 1863. His reign was followed by half a century of international struggles in Scandinavia. The insane tryanny of Christian II. cost that monarch his throne and freedom; the Danes chose his uncle Frederick I. to be their king, while Sweden was forever separated from Denmark, and rose under the Vasas to be a powerful state. (See Gustavus I.).

Under Christian III. (1536–59), the Reformation was established in Denmark. Christian IV. after his brief share in the Thirty Years' War, proved one of the ablest of all the Danish rulers. His liberal and wise policy was, however, cramped in every direction by the arrogant nobles, to whose treasonable supineness Denmark owes the reverse by which she lost (1658) all the possessions she had hitherto retained in Sweden; and with the relinquishment of these, and consequently of the undivided control of the passage of the Sound, the country's former international importance came finally to an end. The national disgraces and abasement which followed led, in 1660, under Christian's son, Frederick III., to the rising of the people against the nobles, and their surrender into the hands of the king of the supreme power. For the next hundred years, chiefly marked by wars with Sweden, the peasantry were kept in serfdom, and the middle classes depressed; but by the end of the 18th century the peasants had been gradually emancipated, while many improvements had been effected in the mode of administering the laws, and the Danish kings, although autocrats, exercised a mild rule. The miseries of the reign of Frederick VI., who governed as regent from 1784, brought the country to the verge of ruin. Denmark having joined Russia in a compact of the northern powers hostile to England, a fleet was sent into the Baltic, and considerable injuries were inflicted by an attack on Copenhagen, in 1801, under Parker and Nelson. From this the country rallied; but in 1807 the British government, suspicious of an intention on the regent's part to violate his neutrality and take sides with Napoleon, demanded the surrender of the entire Danish navy, to be restored at the conclusion of peace. A refusal was followed by the bombardment of Copenhagen in September, 1807, and the fleet was given up; but this treatment drove Denmark into Napoleon's arms, and with him the kingdom was obliged to co-operate until the close of 1813.

By the congress of Vienna, Denmark was compelled to cede Norway to Sweden. From this period a spirit of discontent grew up in the duchies, degenerating into mutual animosity between the Danish and German population, which led to an open rupture with Denmark in 1848, immediately after the accession of Frederick VII. (For the whole question, see Sleswick-Holstein. After alternate hostilities and armistices, the war was virtually concluded in 1850, by the victory of the Danes at Idsted; but in 1863 the quarrel was renewed. On the death of Frederick in that year, Prince Christian of Sleswick-Holstein-Glücksborg ascended the throne under the title of Christian IX., in conformity with the act known as the Treaty of London of 1852, by which the succession to the Danish crown had been settled on him and his descendants by his wife, Princess Louise of Hesse-Cassel, niece of King Christian VIII. of Denmark. A pretender, backed by German influence and help, at once started up in the person of the eldest son of the Duke of Augustenborg, who assumed the title of Duke Frederick VIII. of Sleswick-Holstein; but his cause was speedily merged and lost sight of by Prussia and Austria in their direct aim of incorporating the duchies with the German Confederation. Denmark, unaided by England and France, allies on whose support she had relied, was forced to go single-handed into the unequal contest. After a brave but utterly futile attempt at resistance, the Danes found themselves forced to submit to the terms dictated by their powerful foes, and resign not only Lauenburg and Holstein, but the ancient crown-appanage of Sleswick. By the peace of Vienna, 1864, the Danish king bound himself to abide by the decision which Prussia and Austria should adopt in regard to the destiny of the severed Danish provinces. The dissensions between these two great powers, which led to the Austro-Prussian war of 1866, resulted in the triumph of Prussia, and since then the duchies have remained an integral part of that state. Since the war, Denmark, although reduced to the narrow limits of the islands and Jutland, has recovered from its fall, and has greatly prospered, in spite of the spread of socialistic opinions, and the political dissensions that have ranged the government and Landsthing, supported by the press of the capital, against the Folkething and majority of the people.

In 1870 war broke out between Germany and France and an alliance was formed between France and Denmark, with a view to the protection of the latter from German aggression. The result of the war was the downfall of the French empire; this treaty was dissolved, and Denmark felt that her safety lay in a strict neutrality. Yet the resentment of the country towards Germany was by no means allayed, and the general population were indignant that so many leading politicians were anxious to draw closer the lines that bound Germany and Denmark together. This indignation frequently broke out into such violent manifestations that at last it became evident that anything like a close alliance and understanding between the two states seemed impossible.

The 5th article of the treaty made between Austria and Prussia (23 Aug. 1866) had given to Denmark some prospect of recovering the northern districts of Holstein. There arose, however, considerable discussion with Prussia about the realization of this hope, and Prussia seemed reluctant to give any guarantee for the restoration of the territory. So long as the Emperor Napoleon was in power, this article, which he had not only suggested, but had maintained and advocated, the hope of Denmark for the surrender of North Sleswig appeared reasonable. After the catastrophe of Sedan (1870) this hope was forever abandoned. The French republic took no interest in Sleswig, Italy was equally indifferent, England was occupied in other matters and had learned in the Crimea to shun all meddling with other people's quarrels. The rage of the Danes was roused in 1879 on learning that Germany was discussing with Austria the abolition of Article 5 in the treaty, and even the Danish Court, by the marriage of the Princess Thyra, in 1878, with the Duke of Cumberland, whose dislike for the Germans was well known, had shared, by anticipation, in this expression of feeling. This national sentiment of the Danes took almost a warlike character. In the Rigsdag, 1873, legislative measures were proposed for the reorganization of the land and sea forces and the fortification of Copenhagen. The ruling party in the Folkethings strongly advocated an increase in the army and navy, and an improvement in the coast fortifications; this was advisable as a demonstration of power which would be of effect in the case of war between other nations, but would also secure Denmark against the encroachments of Germany. The representatives of rural constituencies or Agrarians, however, together with the Radicals, were opposed to an active policy on the part of Denmark. The Conservatives, with the sympathy of King Christian, were for warlike preparations, by the increased national defences.

In 1874 the Liberal party, under Fonnesbech, succeeded Holstein-Holsteinborg's Conservative cabinet, which had been in power since 1870, but even the Liberals failed to overcome the opposition which the Folkething persisted in showing to the proposed expenditure on the military and naval forces. The king therefore called into office a ministry of a purely bureaucratic character, which he had counseled Estrup to appoint. Jacob Brönnum Estrup is a remarkable man. Since he took his seat in the Landsthing in 1864, when he appeared as leader of the Agrarians, he has shown both power and patriotism in his political career, and has done much for the advancement of Danish constitutionalism. His desire has been to render Denmark's place among the Powers secure and independent, to develop its resources, and especially to secure for his country adequate protection in the carrying trade of the world's commerce. The King had found in him a man ready to carry out his wise designs for the little realm. In 1866 he had been a leading spirit in the revision of the constitutional code of Denmark, and he strongly advocated the view of the Conservatives that the Folkething, or lower house of the Rigsdag, had not, like the English House of Commons, the sole right to make appropriations from the public treasury. The Radicals of the Folkething, however, claimed supremacy in all matters of taxation and finance, and formed the Left in that assembly. On the other hand, the King and Landsthing, or upper house, according to the Conservatives, had constitutionally the right of overruling the Folkething. Estrup was on the side of those who would not trust the lower house with the sole control of the exchequer. The government, he maintained, was threefold,—King, Landsthing, and Folkething; where any two of them were united against the third, the majority ought to be paramount in deciding the issue. From the time Estrup was appointed Minister of Finance and President of the Council, the clash of parties increased day by day; Estrup again and again brought forth his measures of warlike preparation; again and again were they defeated. In the Folkething the opposition majority increased with every division. In 1876 this party had 74 members as against 27 supporters of the government. It threw out the Budget of Estrup, and the government was compelled to beat a retreat, although the fortification of Copenhagen went forward. This brought about a crisis in political affairs and also led to a new development in the constitution. Estrup stood his ground and was supported by the press as well as by the public opinion of the capital. He maintained that, according to the parliamentary system of Denmark, he had it in his power to propose a provisional finance measure; that such a measure could be carried by the Landsthing, the upper house, which controlled the Folkething. The measure was carried with the approval of the King, and the fortifications at Copenhagen were on their way to be completed. In 1880 two measures were passed for the increase of the army and navy. The opposition thereupon began what was known as the "Verdorrungspolitik," "The policy of blight," i. e., obstruction. Not only did they oppose the finance measures of the government, but every measure, of whatever kind, proposed by Estrup's party and sanctioned by the Landsthing, they threw out. But the King and the ministry remained firm, and were supported by a large majority of the population of the country.

The fortification of Copenhagen was completed with the assistance of volunteer contributions to the amount of $253,333 33. The financial prosperity of the country was evident. The appropriation made for land defences amounted to $10,033,333 33; the department of railways had expended $17,733,333 33. There was still a large balance in the treasury. The history of Denmark from that time is a history of parliamentary struggle. The Moderates of the Left could not keep pace with the violence of the Radicals, and in 1891 an actual rupture took place. The Moderates desisted altogether from the "policy of blight," or obstruction, and drew nearer and nearer to the Conservatives. The consequence was that the Radicals lost their supremacy in the Rigsdag, and in the elections of April, 1892, forfeited many seats. The opening speech of the prime minister in the Folkething (1892) outlined a policy which was not long in being carried out. The Moderate Lefts supported a measure for land defences; the fortifications projected were quickly finished, and the triumph of the Conservative was complete. This was shortly before the resignation of Estrup in 1894. But the fluctuations of parliamentary life in Denmark was not yet complete. The dispute indeed seemed interminable. The Landsthing and the ministry stood on one side, a majority of the Folkething on the other. This majority in the lower house gradually completed the rupture which had been threatened during the debates on land defences, and seemed at last rent asunder permanently into Radicals and Moderates. In August, 1899, M. Hörring became premier. The Radicals had been gathering strength since the retirement of Estrup, and the absence of his firm hand and clear judgment had imperilled the tranquillity of the political voyage in Denmark. In 1900, however, the new Conservatives rallied their strength, and a cabinet was formed by one of their number, M. Schösted, who, after a stormy experience, resigned in 1902, when the Radicals won an overwhelming victory at the polls and a Radical administration, under Prof. Deuntzer, came into power. After the elections of September, 1902, the Landsthing contained 29 Conservatives, 22 Independent Conservatives, 25 Radicals, and 1 Socialist. The ranks of the Independent Conservatives are largely recruited from the Radicals.

The prosperity of Denmark has greatly advanced since its dismemberment in 1864, and the increase in its trade has been remarkable. In 1898, the merchant steam fleet had an addition of 50,000 tons, in the shape of forty-nine individual ships. These form a part of the great tramp fleet that plies between Europe and America. The trade between Denmark and the United States has especially shown a healthy growth, the imports from the United States to Denmark for 1901 being over $21,00,000, while the United States imported from that country goods to the value of more than $2,000,000. This growth of trade between the two countries has been rapid, for the route from Copenhagen to Newport News and Norfolk, Va., was only opened up in 1898. The six Danish steamers engaged on this route also run to New Orleans and carry American goods to all the principal Baltic ports. The New York route has two large steamers newly built in 1898. The Danes emigrate in considerable numbers to the United States and generally settle in the agricultural districts of the west, notably in Illinois. Recent census returns give the annual Danish immigration as about 4,000. Agriculture has been developed in the peninsula to a remarkable degree during the past few years, and dairy produce manufactured with the aid of steam machinery has shown a proportionate increase. There are about 900 steam dairies in Denmark. The sanitary precautions taken by government in the inspection of cattle are more thorough than anywhere else in the world.

The Danish West Indian possessions have recently been looked upon as likely to become territories of the United States. These comprise St. Croix, the largest of the Virgin Islands, St. Thomas, a smaller island further south, and St. John, to the east of St. Thomas. Their united area is 118 square miles. The proximity of these islands to Porto Rico naturally points to their ultimate annexation and their importance as stations in the trade routes of the Caribbean Sea adds to their desirability as United States possessions. There has been for many years a willingness expressed by Denmark to transfer these islands, and the question was brought up afresh in 1902, when a treaty, providing for the sale of the Danish West Indies to the United States for $5,000,000, was signed at Washington by President Roosevelt, 14 January, and ratified by the Senate, 17 February. This was considered to have settled the question finally, but 23 April of the same year the Danish Landsthing passed a resolution postponing a decision as to the sale, until the electors qualified to send members to the Colonial Council should be consulted. The sale was not to be ratified until these electors should approve the cession. The Folkething went even further than this, and refused to ratify the sale, unless the inhabitants of the islands, who are mostly free negroes engaged in the cultivation of the sugar cane and number 35,156, declared in favor of the transfer by a plebiscite. The matter was thus naturally referred once more to the Landsthing, and when the matter came before that body (22 October) their decision was regarded as adverse to the bill. As the Premier reminded the Council, it would be necessary to put out more capital in the islands unless they were sold, and accordingly the West Indian Co., with a capital of $1,000,000, was formed at Copenhagen three days after the decision of the Landsgrath. The object of this company is to promote Danish trade with the Danish West Indies. Trade between Denmark and these three islands had been steadily decreasing for some years, and the Danish government in 1902 appointed a commission to proceed to the islands and report on measures for improving their commercial condition.

Danish Language and Literature.—The Danish language has sprung from the southeastern or Danish-Swedish branch of the *dönsk tunga* (or *lingua danica*), which was the common name by which the language of all the Scandinavians was designated in the Middle Ages by the southern races of the Teutonic stock. From the 11th to the 13th century the Danish-Swedish branch of the Old Scandinavian became more and more markedly distinct from the Norwegian-Icelandic branch, through its replacing the old diphthongs with single long vowels, and dropping the initial *h* before *l, n,* and *r;* while the latter became characterized by a further modification of the *a* sound, by the loss of *v* before *r,* and by a series of contractions of consonants. In the provincial laws of the 12th and 13th centuries, which (after the Runic monuments) are the earliest specimens of this Danish-Swedish language, there are three dialects — that of Skaane (the southmost province of Sweden) and those of Zealand and Jutland, the first of which is nearest the old language, while the last two have deviated from it by dropping the final consonants from the old inflexional endings and changing their vowels *a, i, u* to a less distinct *e* or *æ,* retaining, however, the hard mutes *p, k, t* after vowels, as on the whole is still the case in Swedish and spoken Norwegian. The dialect of Zealand in the 14th and 15th centuries forms the foundation of modern Danish. The original vowels in almost all endings are there replaced by half-vowels and the dental aspirate þ by *t* or *d; p, k, t,* when following long vowels, are changed to *b, g, d;* masculine and feminine are merged in one common gender; nouns have no other case-ending than the possessive *s* for both numbers; verbs cease to indicate person (except in the imperative); and the singular number begins to supersede the plural, as it does everywhere in the spoken language from the 16th century. Danish, like Swedish, retains the suffixed definite article, which is characteristic of the Scandinavian languages. Its form is *-et* in the neuter, *-en* in the common gender, and *-ne* in the plural of both.

The influence of the Hanseatic League and the Oldenburg dynasty (from 1448) brought in a great number of Low-German words, especially relating to navigation and trade; while that of the order of St. Bridget contributed a considerable Swedish element. In the first half of the 16th century the Danish language was chiefly used by religious writers, and the translation of the Bible (1550) is the first important monument of modern Danish. After this period Latin became once more the language of learning and culture, and for a century and a half there was no Danish writer of eminence. The influence of French was predominant in the 17th century, and that of High-German, which had been constant since the Reformation, culminated in the 18th century under the Struensee administration, when it was the language of government and public instruction. The result is, that Danish is indebted to German for fully one third of its vocabulary. It was not till Holberg that the Danish written language began to be enriched from the stores of native expression in the spoken tongue. From the end of the 18th century revived study of Old Scandinavian and the development of a national poetic literature unfolded the language in a hitherto unsuspected richness and fulness, and since that time Danish prose has to a considerable extent worked itself out of its poverty and dependence. Danish is the softest of the Scandinavian languages, though less euphonious than Swedish. It is the language of the educated class in Norway, where it is considerably augmented from the native dialect, and is spoken with a somewhat harder pronunciation. The best histories of the language are by Petersen (2 vols. Copenhagen, 1829–30) and Molbech (*ib.* 1846); grammars by Rask 2d ed. Lond. (1846), Lökke, Munch, Lyngby, Jessen, and Möbius (Kiel, 1871); and dictionaries by the Danish Academy (Copenhagen, 1793–1881), and Molbech (2d ed. 2 vols. *ib.* 1859), who also produced a 'Dansk-Dialekt-Lexikon' (*ib.* 1841) and a 'Dansk Glossarium' (*ib.* 1853–66) for antiquated words. Ferrall, Repp, and Rosing's 'Danish and English Dictionary,' in 2 parts (4th ed. Copenhagen, 1873), is the best for English students.

Literature.—After the Danish dialect had gradually separated itself from the Old Scandinavian as a softer and simpler speech, with a strong infusion of German ingredients, it was little used in writing down to the time of the Reformation. Saxo Grammaticus (that is, "the learned") in the second half of the 12th century wrote in Latin his 'Historia Danica,' the only literary production of mediæval Denmark that retains any interest. The earliest writings in Danish are the church laws of Skaane (1162) and Zealand (1170), and the civil laws of Skaane (1160), Zealand (1170), and Jutland (1241); and after these a number of chronicles, partly in verse, of which the best known is the 'Riimkrönike,' which was the first Danish book printed (in 1495). It is essentially an abridgment of Saxon. The famous Danish ballads called *Kæmpeviser* ("hero-songs"), some of which are said to belong to the latter part of the 11th century, were handed down orally from generation to generation, and were first collected, to the number of 100, by A. S. Vedel in 1591. In 1695 Peder Syv published a new edition with 100 more, and in 1812–14 appeared a selection of 222, edited by Abrahamson, Nyerup, and Rahbek. The most complete collection is in Svend Grundtvig's unfinished 'Gamle Folkeviser' (5 vols. 1853–77). They are about 500 in number, and treat of the adventures of heroes, love, enchantment, spectres, and historical events. Doubtless they were sung to the dance, as is still the case in the Färöe Islands. They must have suffered much by their not being written down till the 16th and 17th centuries.

The Reformation only emancipated Danish culture from Latin to bind it fast to German, which at the death of Frederick I. in 1533 was the language of the upper classes. About that time Christian Pedersen set up a printing-press at Malmö, at which he published a great number of popular books, and finally in 1550 the first complete translation of the Bible. Pedersen (1480–1554) is justly called the father of Danish literature. The hymns and translations of the Psalms by his contemporary Tausen (1494–1561), as also by Kingo (1634–1703), Vormondsen (1491–1551), and Arrebo (1587–1637), and the national history (10 vols. Copenhagen, 1595–1604) of Hvitfeld (1549–1609) were well received; but the Danish language was still banished from higher society till the advent of the Norwegian Holberg (1684–1754), the founder of Danish comedy. He found Denmark on the point of being absorbed in Germany. "The common peo-

ple," he says, "had no histories but dry lists of dates; no poetry but congratulatory verses; no theology but homilies and funeral sermons; and for plays, nothing but old stories about Adam and Eve." He wrote histories of Denmark, of the Jews, and of the Church; and the irresistible humor of his comedies and satires covered with ridicule the imitators of foreign speech and manners. What Holberg did for Danish prose, another Norwegian, Tullin (1728–65), did for Danish poetry. Equally dissatisfied with the current imitations of the 17th century court poetry of France, and with the poetic reform of Klopstock (at Copenhagen from 1751), Tullin followed the guidance of the English poets Pope, Young, and Thomson, and in this was followed by most of his countrymen who were settled at Copenhagen, while the Danes clung to German models. Ewald (1743–81), an ardent disciple of Klopstock, was Denmark's first great lyric poet and tragic dramatist. His verse shows an unsurpassed mastery of form, and is expressed in pure, clear, and noble language. Wessel (1742–85), by his "tragedy," 'Love without Stockings' (1772), a humorous parody of the Danish imitations of the classical French drama, succeeded in laughing them off the stage. Nordahl Brun (1745–1816), preacher and poet, Claus Frimann (1746–1829), "The Burns of the Norwegians," Claus Fasting (1746–91), Jonas Rein (1760–1821), Jens Zetlitz (1761–1821), and others, formed themselves (1772) into a "Norwegian Society" at Copenhagen, under the leadership of Wessel. It was the literary manifestation of the Norwegian aspiration to separate nationality, which afterward led to the foundation of the university of Christiania in 1811. From the death of Wessel in 1785 to the beginning of the present century the literature became entangled in rationalistic and political polemics, and produced little that is noteworthy. Its chief writers were P. A. Heiberg (1758–1841) and Malte Konrad Brun (1775–1826), both of whom were driven into exile in 1799–1800, the latter afterward famous as a geographer; the critic Rahbek (1760–1830); the dramatists Samsö (1759–96) and Sander (1756–1819); and the lyrist Thaarup (1749–1821).

The poet and humorist Baggesen (1764–1826) forms the link between the 18th century and the early part of the 19th, when Danish literature took an entirely new departure, partly owing to the study of Kant, Fichte, and Schelling, and the influence of Schelling's follower Steffens (1773–1845); partly also to the strict censorship of the press in force from the year 1799. The educated classes turned from their controversies on points of literary criticism and theology to scientific inquiry; and the people, whose national feeling had been aroused by the French Revolution, by the share of Denmark in the Napoleonic wars, and especially by the events of 1801 and 1807, the war with Sweden (1808), and the loss of Norway (1814), welcomed with enthusiasm the rise of a new school, led by the romantic poet Oehlenschlager (1779–1850), who was equally distinguished as a lyrical and dramatic writer, and is still regarded by many as the greatest Danish poet. Contemporary with him were the poets Schack-Staffeldt (1769–1826) and Grundtvig (1783–1872), afterward more eminent as a theologian; Ingemann (1789–1862), long the most popular novelist of Denmark; J. L. Heiberg (1791–1860), director of the royal theatre at Copenhagen, writer of numerous vaudevilles, and of the still popular national play 'Elves' Hill' (1828); Hauch (1791–1872), dramatist, novelist, and critic; and Blicher (1782–1848), who in his tales of Jutland was the first worker in the field which has since been cultivated in Germany by Jeremias Gotthelf and Berthold Auerbach. Of the other novelists of this period the chief are Brosboll (b. 1820); Fru Gyllembourg-Ehrensvard (1773–1856), mother of J. L. Heiberg; Saint-Aubain, or "Karl Bernhard" (1798–1805); and the still more popular Winther (1790–1870), the charming poet of Danish country life Herz (1798–1870), from the time when his 'Ghost Letters' (1830) surprised the public with a poetic revival of the muse of Baggesen, has, now with his lyric poems, now with his tales, now in romantic and national tragedies, now in comedies and light vaudevilles, provided his countrymen with artistic and attractive works. Overskou (1798–1874) is a skilful dramatist, and Hostrup (1818–92) a popular author of comedies. All these writers are surpassed by Hans Christian Andersen (1805–75), whose wonderful stories are known throughout the civilized world. Less popular, but more profound, was the versatile writer Fr. Paludan-Müller (1809–76), who from his play 'Love at Court' (1832) to his great epic poem 'Adam Homo' (1841–48) has wooed all the muses in succession. Here may be mentioned Bergsöe (b. 1835), writer of novels and popular works on scientific subjects; Goldschmidt (1819–87), editor of the influential Democratic journals, 'The Corsair,' 'North and South,' and 'Home and Abroad,' and afterward author of numerous romances; Holst (1811–93), a writer of pleasing lyrics and tales; Kaalund (1818–85), with his two collections of poems 'A Spring' and 'An Autumn'; the erotic and piquant and sometimes frivolous song-writer Aarestrup (1800–56); and Lembcke (b. 1815), the translator of Shakespeare.

A great impulse was given to all branches of science from the beginning of the 19th century. The leading theologians were Grundtvig, the enthusiastic champion of the faith of his fathers against rationalism, and advocate of a union of the Scandinavian kingdoms, but with the Church separated from the state; Mynster (1775–1850), Bishop of Zealand; Clausen (1793–1877), the disciple of Schleiermacher, and theological opponent of Grundtvig; Martensen (1808–84), Bishop of Zealand, and author of standard works on systematic theology and ethics; and Kierkegaard (1813–55), the most original thinker of Denmark. The chief exponents of philosophy were Sibbern (1785–1872), Nielsen (b. 1809), and Bröchner (1820–76); and in natural science the greatest names were those of Oersted (1777–1851), the discoverer of electro-magnetism, the botanist Schouw (1789–1852), the geologist and chemist Forchhammer (1794–1864), and the zoologist and archæologist Steenstrup (b. 1813). Much has been done for the study of Scandinavian antiquity by the 'Sagabibliothek' of Müller (1776–1834), and the researches of Finn Magnusson (1791–1846) in mythology, and of Thomsen (1785–1865) and Worsaae (1821–85) in archæology. The chief 19th-century writers of national history have been Werlauff (1781–1871), Molbech (1783–1857), Allen (1811–77), Schiern (b. 1816), and K. P. Paludan-Müller (1805–82); and of the history of the national literature and language, Petersen (1781–1862). In philology,

Rask (1787–1831) and Madvig (1804–86) have a European fame.

About 1850 the enthusiasm for the national past, which had been excited by Oehlenschläger in Denmark, and by Tegnér, Geijer, and others in Sweden, together with the hatred of Germany aroused by the war of 1848–50, rose to a pitch of fanaticism. "The northern force which had controlled the world" was extolled by Ploug and others as "the only means whereby the victory of the Cause of Humanity could be achieved." After Ploug (b. 1813) the chief exponents of this great historic mission of the northern kingdoms were C. K. F. Molbech (1821–88) a euphonious lyrist and skilful dramatist, and translator of Dante; and Erik Bögh (b. 1822), a fertile writer of *feuilletons* and adapter of plays. A cosmopolitan reaction set in about 1870, led by Georg Brandes (b. 1842), who proved in his lectures on literature that Denmark was only a side-chapel in the temple of European thought and art, and that this overstrained "Scandinavianism" was but the northern phase of the reaction from the tendencies of the 18th century, which had been experienced in England, France and Germany many years before. Brandes withdrew to Berlin for some years from the storm of popular opposition. Not only in Denmark, but in Norway and Sweden also, his followers are now the prevailing party. The most conspicuous of these have been Jacobsen (1847-85), the translator and adherent of Darwin, and author of 'Mogens' (1872) and other novels; and (till in 1883 he became a Conservative) Drachmann (b. 1846). Of recent writers, the most noteworthy are Schandorph (b. 1836), who is equally happy in his sketches of the Zealand peasant and the Copenhagen snob; the versatile writer Hermann Bang (b. 1858); and the dramatist Edvard Brandes (b. 1847), brother of Georg Brandes.

Of the three Scandinavian nations, the Danes have shown the greatest aptitude for the imitative arts, and their art is comparatively the most independent. While the painters of Norway have been mostly trained at Düsseldorf, and those of Sweden at Paris, the artists of Denmark have been especially attracted to Rome. The sculptor Thorwaldsen (q.v.) has left a great monument of his genius in the works contained in the Thorwaldsen Museum at Copenhagen. Of later artists may be mentioned the painters Marstrand, Carl Bloch, Exner, Kroyers, Henningsen, and Otto Bache. Of music, the chief composers in the 19th century have been Hartmann, Gade, and Heise.

Consult: Nyerup and Rahbek, 'Den danske Digtekunsts Historie', 4 vols. (1800-8), and 'Udsigt over den danske Digtekunst under Frederik V. og Christian VII.' (1819-28); Nyerup and J. E. Kraft, 'Almindeligt Litteraturlexikon for Danmark, Norge og Island' (Copenhagen, 1818–20); Peterson, 'Den danske Literaturs Historie', 6 vols. (1853-64); Overskou, 'Den danske Skueplads i dens Historie' (1859–74); G. Brandes, 'Ludwig Holberg og hans Tid' (1884); the general treatises in Danish by Thortsen (1814; 6th ed. 1866), Heiberg (1831), Molbech (1839), Strom (1871), Erikson (Christiania, 1878), Winkel-Horn (1880), and Hansen (1884 et seq.); and in German by Strodtmann (1873), Wollheim de Fonseca (1874-77), and Winkel-Horn (1880); Gosse 'Studies in the Literature of Northern Europe' (1879); Anderson, 'History of the Scandinavian North' and 'Norse Mythology'.

Denne-Baron, Pierre Jacques René, pē-ār zhäk rė-nā dān bä-rôṅ, French poet and essayist: b. Paris 6 Sept. 1780; d. there 5 June 1854. He had much learning and a faultless taste; 'Hero and Leander' (1806); and 'Poetic Flowers' (1825) being delightful though not great, while his 'Dictionary of Conversation' is widely known.

Den'ner, Balthazar, German portrait painter: b. Altona 15 Nov. 1685; d. Rostock 14 April 1749. He was painter to several courts, executing portraits of princes and dignitaries, and was noted for his extraordinary minuteness of finish. Among his works are: 'Head of an Old Woman'; for which Charles VI. paid 4,700 florins; and 'Head of an Old Man,' both in the Vienna Museum; and many canvases in other famous galleries.

Dennery, Adolphe Phillipe. See ENNERY, ADOLPHE PHILLIPE DE.

Dennewitz, dĕn'nē-vĭts, Germany, village in the province of Brandenburg, Prussia, famous for the battle between the French and Prussians, 6 Sept. 1813, the former commanded by Ney (under whom were Oudinot, Bertrand, Reynier, and Arrighi), the latter by Tauenzien and Bülow. Forty thousand Prussians maintained their ground for several hours against 80,000 French; and on the arrival of the Russian and Swedish battalions victory declared in favor of the allies, who, after the Russians and Swedes came up, were far superior in numbers. The French were defeated, and fled in disorder.

Dennie, Joseph, American journalist: b. Boston 30 Aug. 1768; d. Philadelphia 7 Jan. 1812. He published 'The Farrago' (1795), essays on life and literature. From 1796 to 1798 he edited with great success the 'Farmer's Weekly Museum' at Walpole, N. H. In this appeared his essays signed "The Lay Preacher," whose droll and easy style made him popular. In Philadelphia (1801), assisted by Asbury Dickens, he founded the 'Portfolio,' which he edited till his death under the pen-name of "Oliver Old-School." Two collections of his writings have been published: 'The Lay Preacher, or Short Sermons for Idle Readers' (1796); and 'The Lay Preacher' (1817).

Dennis, John, English dramatist and critic: b. London 1657; d. 6 Jan. 1734. In 1697 he produced a comedy entitled 'Plot and No Plot,' which was followed by several dramatic pieces and poems of little value. He also became a political writer for the Whig party. The irritability of his disposition, heightened probably by the unprosperous state of his finances, involved him in perpetual broils, and made him a sort of standing jest with the wits of his time. He wrote some severe strictures on Addison's 'Cato' and Pope's 'Rape of the Lock.' Pope in return gave him a place in the 'Dunciad,' and in conjunction with Swift produced a sarcastic tract entitled 'A Narrative of the Deplorable Frenzy of Mr. John Dennis.' In his old age his necessities were relieved by a benefit at the Haymarket Theatre, to which his former antagonist, Pope, contributed a prologue.

Dennis, Robert, English journalist: b. Bodmin, Cornwall, 5 Jan. 1855. He was educated at Leipsic, was for a time reporter and

assistant editor on the *Mail* and Glasgow *News*, and then, removing to London, served on the staff of various London papers, and has been news editor of the London *Daily Express* from its foundation. He has published 'Industrial Ireland' (1887); 'History of the Baronetage' (1887); 'The New Politics' (1898); 'A Romance of Tottenham' (1899).

Dennison, William, American statesman: b. Cincinnati, Ohio, 23 Nov. 1815; d. Columbus, Ohio, 15 June 1882. He was graduated at Miami in 1835 and became a lawyer, being elected to the Ohio legislature in 1848. He became governor of Ohio in 1860, and rendered invaluable aid to the Union cause throughout the Civil War. President Lincoln appointed him postmaster-general in 1864, an office he retained under President Johnson, resigning in 1866. Dennison College owes much to his liberality.

Denon, Dominique Vivant, dō-mē-nēk vē-vaṅ dē-nôn, BARON DE, French artist, diplomatist, and author: b. Châlons-sur-Saône 4 Feb. 1747; d. Paris 27 April 1825. He was attached to embassies at St. Petersburg, Switzerland, and Naples, successively. Becoming acquainted with Bonaparte, he accompanied the general in his campaigns to Italy and Egypt, and Desaix to Upper Egypt. The work which was the result of this journey, 'Voyage dans la Basse et la Haute Egypte,' was issued in 1802. When he returned to Paris with Bonaparte he was appointed inspector-general of the museums and all the works of art executed in honor of the French successes — monuments, coins, the erection of the triumphal pillar in the Place de Vendôme, etc. He accompanied Napoleon in all his campaigns, and employed himself in drawing and in selecting those masterpieces in the conquered countries, which were taken to Paris as trophies. After the abdication of the emperor he retained his office, but was deprived of it in 1815, in consequence of having joined Napoleon on his return from Elba. He retained, however, his place in the Institute. From that time he lived retired, and the preparation of engravings and lithographs of his splendid collection of works of art formed the occupation of his last years. In 1826 appeared at Paris the 'Description des Objets d'Art Composant le Cabinet de feu M. le Bar. V. Denon.'

Dens, Petrus, author of a manual of Catholic theology: b. Boom, Belgium 1690; d. Mechlin 15 Feb. 1775. He is noteworthy only as author of a manual text-book of Catholic theology, 'Theologia Moralis et Dogmatica' (Moral and Dogmatic Theology). This work, which, it seems, was used as a text-book in the ecclesiastical college of Maynooth in Ireland, happening to come under notice of some zealous opponents of the Roman Catholic Church, was translated (in whole or in certain parts) and published at Dublin in 1832 in the interest of anti-popery. The so-called incriminating passages in the work do not differ essentially from corresponding portions of other treatises on the same subjects used in Catholic schools of theology. The author of the treatise was a professor in the diocesan seminary of Mechlin and during 40 years was president of the institution. He was also honored with several offices of importance in the diocese of Mechlin — Canon Penitentiary, synodical examiner, archpriest of the Metropolitan Cathedral of Belgium, and other offices.

Densimeter, an instrument invented by Colonel Mallet of the French army, and M. Bianchi, for ascertaining the specific gravity of gunpowder. It consists of a glass globe having a tube which communicates with a quantity of mercury in an open vessel. The globe is joined at top to a graduated glass tube, which may, by means of a flexible tube, be connected with an air-pump. A diaphragm of chamois skin fits over the lower, and one of wire-cloth over the upper orifice of the globe, and the tubes above and below those orifices are provided with stop-cocks. For ascertaining the density of the gunpowder, the air is exhausted from the globe by means of the air-pump, until the mercury rises to a certain mark on the graduated tube when the globe is detached from its support and weighed. It is then emptied and cleaned, and a given weight of gunpowder introduced, when it is again attached to the tubes and the air exhausted as before, filling with mercury all the space in the globe not occupied by the powder, up to the mark before indicated. The stop-cocks are now closed, and the globe once more detached and weighed. The absolute specific gravity of the powder is obtained by multiplying the weight of the powder contained in the globe by the known specific gravity of mercury, and dividing the product by the product resulting from multiplying the difference between the weight of the globe when filled with mercury alone, and its weight when filled with mercury and powder, by the weight of the powder employed in the experiment.

Density, a term denoting the quantity of matter per unit of volume in a body. A cubic inch of lead is considered to contain a greater quantity of matter than a cubic inch of wood, and lead is thus said to be more dense than wood. Mass or quantity of matter is measured by its inertia, according to Newton's celebrated "laws of motion"; or, since Newton has shown experimentally that gravity and inertia are proportional, the mass of a body is measured by its weight. A comparison of the weights of equal bulks of various bodies results therefore in a comparison of their densities. In order to test the densities of various bodies conveniently, a standard substance is fixed on, and the densities of other substances are reckoned by comparison with this. For all liquids and solids, water at a fixed temperature is taken as the standard; and for all gases the standard is common air at a fixed temperature and barometric pressure. There is however some variation in the temperature fixed on, in the first case, and in both the temperature and pressure fixed on in the second. Thus in England the standard temperature for water used to be 60° F. and sometimes 62° F. The latter temperature is mentioned in the legal definition of the imperial gallon. Again, in the case of gases the standard temperature was 60° F. or 62° F., and the standard pressure 30 inches of mercury in the latitude of London.

The metric system on the other hand, makes use of the temperature 4.1° C. (the temperature of the maximum density of water) as the standard for water, and of the pressure 76 centimeters of mercury in latitude 45° as the standard barometric pressure. For gases the temperature

0° C. (the melting point of ice) is always employed as the standard. See GRAVITY, SPECIFIC.

Density of the Earth.—The determination of the density of the earth as compared with that of water or any other known body, is a subject which has excited considerable interest among modern mathematicians; and nothing can, at first sight, seem more beyond the reach of human science than the due solution of this problem; yet it has been solved and on such principles that, if it be not exactly correct, it is probably an extremely near approximation. The first idea of determining the density of the earth was suggested by M. Bouguer, in consequence of the attraction of Chimborazo, which affected his plumb-line while he was engaged with Condamine in measuring a degree of the meridian near Quito, Peru. This led to the experiments on the Schehallien Mountain, in Scotland, which were carried on under the direction of Dr. Maskelyne, and afterward submitted to calculation by Dr. Hutton, who determined the density of the earth to be to that of water as 4½ to 1. But in consequence of the specific gravity of the mountain being assumed rather less than it ought to have been, the above result is less than the true density, as has since been shown by Dr. Hutton and Professor Playfair, the former of whom makes it, in his corrected paper, as 99 to 20 or nearly as 5 to 1. The same problem was attempted on similar principles, but in a totally different manner by Henry Cavendish who found the density of the earth to be to that of water as 5.48 to 1. Taking a mean of all these we have the density of the earth to that of water as 5.24 to 1. Two calculations made on quite different principles by two physicists in 1899 showed the surprisingly similar results of 5.5270 and 5.5273.

Den'slow, William Wallace, American illustrator: b. Philadelphia 5 May 1856. He studied art at Cooper Institute and at the National Academy of Design, New York. He has been a prolific illustrator since 1872, at first being a traveling illustrator for the leading American newspapers. Among his works are the pictures: 'What's the Use?' 'Victory,' and 'The Heathen Chinee.'

Dent, Frederick Tracy, American soldier: b. White Haven, Mo., 17 Dec. 1820; d. Denver, Col., 24 Dec. 1892. He was graduated from the United States Military Academy at West Point in 1843, and served in the Mexican war, being engaged in the siege of Vera Cruz, and the battles of Churubusco and Molino del Rey. He took part in the Yakima expedition (1856), in the Spokane expedition, and in the Snake River expedition (1860). During the Civil War he commanded a regiment in the Army of the Potomac in 1863; was stationed in New York in September 1863, where riots were feared, and was Grant's aide-de-camp throughout the Richmond campaign. He was secretary to President Grant during his first administration. He retired from active service in 1881, with the rank of brigadier-general in the regular army.

Dental Formula. See TEETH.

Dental Schools. The Baltimore College of Dental Surgery, established 1839, was the first institution of the kind in the world. Other schools in the United States are: Ohio College of Dental Surgery (1845); Pennsylvania College of Dental Surgery (1856); Philadelphia Dental College (1863); New York College of Dentistry (1865); and dental departments at Harvard since 1867, University of Michigan since 1875, and University of Pennsylvania since 1878.

Dental Societies. In 1840 the American Society of Dental Surgeons, the pioneer of the associations to which dentistry owes so much of its progress, was organized in New York. The National Association of Dental Faculties, organized in 1884, has done much to strengthen courses of study in dental schools. At the time of its organization only those schools were admitted which had proper facilities for instruction and a corps of competent teachers. From time to time standards have been raised by rules governing attendance, instruction, and graduation. There are at present 47 schools in the association, all of which require three full courses of dental lectures. The National Association of Dental Examiners was organized in 1883 to secure higher and more uniform standards for admission to dental practice.

Denta'lium, a genus of mollusks of the class *Scaphopoda,* the shell of which consists of a tubular arcuated cone open at both ends, and resembling the tusk of an elephant in miniature. They bury themselves in the sand, and capture their food, which mainly consists of foraminifers, by means of their tentacles. *Dentalium* is one of the three genera constituting the small class *Scaphopoda.* There are many species, known by the common name of tooth-shells. *D. elephantinum* occurs off the British coasts.

Denta'ria, pepper-root, a genus of plants of the natural order *Cruciferæ.* There are about 15 species, natives of temperate countries, of which 11 are found in America. They are ornamental herbs, with creeping singularly toothed root-stocks, from which they receive the names of pepper-root and toothwort. The stem-leaves are opposite or in whorls of three, and the flowers are white or pink. The American species extend from Nova Scotia to Florida and west to Minnesota and Louisiana. The best-known is the pepper-root, crinkle-root, or toothwort (*D. laciniata*). The common names refer to the pungent and tooth-like divisions of the root, which is, in some localities, ground and used like horse-radish.

Denta'tus, Manius, or **Marcus, Curius,** Roman statesman, flourished in the first half of the 3d century B.C. His first office was tribune of the people, in which he distinguished himself by his opposition to Appius Claudius Cæcus, who, in defiance of law, refused to receive any votes for plebeian candidates. In 290 B.C. he was consul with P. Cornelius Rufinus, and by his decisive victories over the Samnites terminated a war which had lasted for 49 years. In 275 B.C. he was again consul, and near Beneventum defeated King Pyrrhus. The triumph which followed was one of the most magnificent which had ever been witnessed, and was remarkable for the presence of four elephants, which were then seen for the first time in the streets of Rome. In 274 B.C. he was a third time consul, and after terminating the war with the Lucanians, Samnites, and Bruttians, retired to his Sabine farm and spent the remainder of his life in cultivating it.

Den'tex, a genus of acanthopterous fishes near perches. One species (*D. vulgaris*), the *Dentex* of the ancient Romans, abounds in the Mediterranean, and has occasionally been taken on the southern shores of Great Britain. It is voracious, and has large, sharp teeth. It is sometimes seen three feet in length, and 20 to 30 pounds in weight. Great numbers are taken in the mouths of rivers in Dalmatia and the Levant, where they are cut in pieces, and packed in barrels with vinegar and spices, just as the ancients used to treat them.

Den'tifrice (Lat. *dentifricium*, a tooth-powder, *dens*, tooth, *fricare*, to rub), any preparation, liquid or powder, for the purpose of cleaning the teeth. Chalk, precipitated, is generally the base of most of the dentifrices on the market. For detergents, charcoal, cuttlefish-bone or pumice are sometimes incorporated with the milder principle. Bleaching salts and acids find their way in many market preparations, constituting a grave danger to the tooth structure. A few drops of any of the standard antiseptics added to water will often prove an efficient cleanser aided by the friction of the brush.

Den'tils, in architecture, the little cubes or small squarish blocks resembling teeth, into which the square member in the bed-molding of an Ionic Corinthian, composite and occasionally a Roman Doric cornice is divided. Their breadth should be half their height, and the metoche (interval) between them two thirds of their breadth.

Dentin, or **Dentine**, dĕn'tĭn, the bone-like structure constituting the body of a tooth, which in the crown portion is covered by enamel and in the root portion by the *crusta petrosa* or cementum. See TEETH.

Dentistry is a special department of the science and art of healing; embracing a knowledge of the structure, physiology, and pathology, and the therapeutic, surgical, and mechanical treatment of the tissues of the mouth and its contained organs, also a knowledge of the materials used and their manipulation in the restoration of the dental and oral structures.

Operations upon the teeth for relief from distress caused by diseases and accidents to which they are subject were doubtless performed concurrently with man's first efforts to relieve his other bodily ills. Dentistry as a distinct vocation is first alluded to in the writings of Herodotus (500 B.C.), but evidences of a much earlier practice are furnished by Egyptian and Hindu records and by the teeth in the crania of some of the earlier aboriginal races. The early Greeks and Romans were evidently familiar to some degree with dental art, for in the celebrated laws of the 'Twelve Tables' (450 B.C.) we find reference thereto in the Tenth Table, as follows: *Neve aurum addito: cui auro dentes juncti escunt, ast im cum illo sepelict, uretve se fraude esto.* "If anyone's teeth have been bound together with gold it shall not be unlawful to bury him with it." It is probable that the Romans derived their knowledge of dental art from the Etruscans, who in turn derived theirs from the Egyptians, the fountain-head of the arts and sciences. Of the growth of dental art from the time of Hippocrates until the Christian Era but little is recorded, and even thereafter, until the 17th century, such advances as were made in a knowledge of the teeth were largely in relation to their structure and functions, but the recorded observations were much influenced by the superstition and ignorance of the time, and are consequently of but little value. The observations of Antoni van Leeuwenhoek of Delft, Holland, on the anatomy of the teeth, published in 1678, contained an account of his discovery of the tubular structure of the dentin — a discovery made possible by the aid of a crude form of microscope which the author had invented. Up to this period operations upon the teeth were largely practised by surgeons and not infrequently by barbers, and were limited principally to extraction and the treatment of toothache and abscesses or inflammatory disorders of the soft tissues surrounding the teeth. The restoration of teeth by mechanical means and the filling of cavities caused by decay of their structure called for a type of skill which the training of the surgeon and physician did not furnish, hence there was developed from the crafts of the artisan, the goldsmith and the workers in precious metals, the dental mechanic, whose skill enabled him to devise and fashion the substitutes for lost dental organs, an art which later, as a result of systematic study and organized professional training, has developed a high degree of perfection.

The development of modern dentistry as a professional calling has had a distinctly double origin: first, as an outgrowth of medicine and surgery, certain practitioners of these arts in the earlier days devoting themselves to dental practice and adding to their medical qualifications such technical and manipulative skill as enabled them to meet the public demand for restorative operations upon the teeth; second, the artisan or mechanic dentist who acquired so much of medical and surgical knowledge as enabled him to treat with some measure of success the dental diseases with which his calling confronted him. In England at the beginning of the 19th century the best practitioners of dentistry were medically educated men, of whom Joseph Fox, lecturer on diseases of the teeth at Guy's Hospital, London, may be taken as the type. Both Fox and his successor, Thomas Bell, published works on diseases of the teeth which for their time were standards. The works of other British writers on the same subject, notably those of Koecker, Jobson, Waite, and Alexander Nasmyth, all made their appearance in the first half of the 19th century. The works of these English practitioners and teachers were characteristic of the medically and surgically educated practitioners in that the anatomical, pathological, and therapeutic departments of dental science and practice were strongly emphasized by them, while the manipulative phase and restorative department of dental art were given a minimal recognition.

Of the earliest origin of the art of mechanically restoring lost dental structures the records are obscure. Jaws in which natural teeth or carved imitations of them were inserted and retained by means of gold bands affixed to adjoining sound teeth have been found in early Etruscan tombs — specimens of this character being preserved in the museum of Pope Julius in Rome and elsewhere. Specimens of similar restorations are also recorded as having been found in the mouths of Egyptian mummies. No rec-

ord, however, of a systematic presentation of this department of dental art is known to have been published until the work of Pierre Fauchard made its appearance in France (1728). This treatise upon the art of dentistry was most complete for that period, and so great was its originality that its author has with much justice been called the "father of modern dentistry." Fauchard was born in Brittany (1680) and died in Paris (1761). In the preface to his book he makes the following interesting statement regarding the then existing status of dentistry: "The most celebrated surgeons having abandoned this branch of surgery, or at least having but little cultivated it, the negligence has been the cause of its being embraced by those who, without theory and without experience, practise it without principles or methods. It is only recently that in the city of Paris the eyes have been opened to this abuse, and an easy examination is required of those who devote themselves to the treatment of these diseases, after which they are granted the title of Experts upon the Teeth, although several among them are only provided with a knowledge below mediocre." As it was provided that the examination referred to should be conducted by "men learned in all branches of medical science" who should decide upon the merits of the applicant, we have in this measure the first recorded attempt at the statutory regulation of dental practice which is now a generally exercised safeguard to the public health in all nations. The work of Fauchard gave an impulse to the practice of dental art and tended to specialize it as a distinct calling; it was the art of Fauchard which was implanted upon American soil by the French dentist, Joseph Lemaire, a surgeon attached to the forces of Count Rochambeau, whose army was quartered with the Colonial troops near Providence, R. I., during the winter of 1781–2. Although Lemaire had been preceded in 1756 by one Robert Woofendale, a student of Thomas Berdmore, dentist to His Majesty King George III., and probably by one or two others of whom the records are obscure, the importance of Lemaire's visitation attaches to the fact that he took occasion to instruct in his art Josiah Flagg, a young man holding a major's commission in the Colonial army, and he thus educated the first dentist native to this country. Another who profited by Lemaire's instruction along with Josiah Flagg was James Gardette who arrived with the French fleet in the capacity of naval surgeon, but who through his interest in the work of Lemaire turned his attention to dentistry and after the close of the war went to Boston, thence to New York in 1783, and finally in the autumn of 1784 settled in Philadelphia, where he practised his profession as dentist until 1829, when he returned to France and died in Bordeaux (1831). The career of Gardette as a dental practitioner was remarkable not only from a financial standpoint, but by reason of the intelligence which he exercised in his calling and the ingenuity and skill which characterized his work. He added many useful improvements to dental art and attained much prominence as a skilled and ethical professional man.

Early in the 19th century several dentists who did much to elevate dental practice and place it upon a professional plane arrived in America from Europe. Edward Hudson, a native of Ireland, and Leonard Koecker, of Germany, both of whom practised in Philadelphia, were noted for their excellence as practitioners and their high professional standing. These early pioneers of American dentistry were practitioners *sui generis*. Their means of education and professional training were limited to what they could obtain from preceptors and the scanty literature of the time, but what they lacked in educational facilities was more than compensated by their natural ability and enthusiasm, and so excellent were the standards which they raised that much that is best in modern dentistry is to be justly credited to their almost unaided achievement and professional example. The success of the early practitioners and the increasing demand for dental service coincident with the growing population, brought about a corresponding increase in the number of those who offered their services to the community as dentists. There being no legal restrictions upon practice, anyone might advertise himself as a dentist regardless of his qualifications for the practice of that specialty, hence, tempted by the emoluments and position which dentistry seemed to offer, many incompetents engaged therein and charlatanism was rife. The only means of obtaining a practical knowledge of the art of dentistry was through the instruction of a preceptor who had similarly acquired it, hence the instruction of apprentices became a lucrative business, as large fees were charged for initiating the novice into the art and mystery of dental practice. The knowledge thus gained at considerable cost and having a commercial value was jealously guarded, and with but few exceptions professional intercourse among practitioners was an unknown feature. This deplorable condition of affairs becoming intolerable to those dentists of more liberal tendencies, an attempt was successfully made in New York in 1787 to organize a local association of dentists, and in 1840 in the same city a national association, the American Society of Dental Surgeons, was organized, mainly through the efforts of Dr. Horace H. Hayden of Baltimore, "to advance the science by free communication and interchange of sentiments."

The year previous to that which saw the creation of the American Society of Dental Surgeons the first dental journal in the world had been established through the instrumentality of Dr. Chapin A. Harris, who had enlisted a number of the more liberal and enthusiastic of his colleagues in the enterprise, and in 1840 the first college in the world for the systematic education of dentists, the Baltimore College of Dental Surgery, opened its first course of lectures and laboratory instruction in the science and art of dentistry. The charter for the institution, which is still in successful operation, was obtained from the legislature of Maryland by Drs. Harris, Hayden, and others. In the years 1839–40 there were thus established the three essential factors of professional growth in dentistry — the college, the association, and the journal. The establishment of these means of systematic dental education upon an independent basis with a separate organization for associated work among dental practitioners led to the growth of dentistry as a professional calling, distinct from medicine, although it is essentially a department of the science and art of

healing by virtue of the fact that it deals with the diseases of a most important part of the human organism, which have intimate vital relationships with the entire body, and for its successful practice demands as broad a knowledge of the fundamental medical sciences as that required by the practitioner of any other medical specialty.

The distinguishing factor of dental training, and one which is not required to the same degree in any other department of the healing art, is the manual skill and mechanical training needed for the successful practice of the prosthetic or restorative operations which the dentist is constantly called upon to perform. It was the lack of facilities in medical schools for obtaining the necessary training in the mechanical procedures of dental art that led to the establishment of the first dental college and placed dental education upon a basis independent of general medical education. The increase in knowledge of the diseases of the mouth and its contained organs and the growing recognition of the vital relationships of the oral tissues to the body as a whole, have gradually compelled the broadening of the dental educational curriculum until at present all of the fundamental medical sciences are included in the *curricula* of the best dental colleges, and upon this scientific foundation is erected the superstructure of technical education and manual training necessary to the art of the dentist.

The development of dentistry in America has been phenomenal, especially in all that pertains to its art side. The incorporation of the systematic teaching of mechanical dentistry in the college course instead of depending upon the uncertain educational results of the apprenticeship system has had greatly to do with creating a body of American practitioners skilled in their art. It is in fact for his skill as an operative dentist that the American practitioner has been mainly distinguished, while his contributions to the scientific basis of dentistry have been on the whole less voluminous than those of European practitioners, especially in the domain of original scientific research. The art of replacing lost portions of tooth crowns by gold fillings has had its greatest development in America, indeed as we know the operation to-day it may be said to have originated there. As originally practised the ideal gold filling was one which simply acted as a stopper inserted in a cavity produced by decay, for the purpose of excluding moisture and furnishing a surface sufficiently resistant to withstand the wear and tear of mastication. The filling was finished on a level with the cavity margins and no attempt was made to restore the lost contour of the tooth in imitation of its natural configuration. When, however, the discovery of the cohesive property of annealed gold foil was made and promulgated by Dr. Robert Arthur, of Baltimore, in 1855, the whole method of filling teeth with gold was revolutionized and complete artistic restoration of the normal configuration of the tooth by building with gold foil became the accepted ideal of practice. In connection with the general use of cohesive gold as a filling material certain ingenious and important devices came into existence as adjuncts to the operation of tooth-filling, having their origin in the necessities of the case. These were the dental engine, the mallet, and the rubber coffer-dam.

The operation of preparing the cavity for the reception of the gold involves the removal of decayed portions and frail margins, and giving to the cavity a retentive shape, so that the filling when inserted shall be solidly and immovably held in place. The early methods of cavity preparation were laboriously performed by small chisels and cutting instruments manipulated exclusively by the hand. Hand instruments were also exclusively used for the insertion and condensation of the gold foil in building the filling and subsequently giving it the required form and surface finish. The introduction of the dental engine run by foot-power, or as in its more recent modifications by electric motor, has not only greatly facilitated the operation of tooth-filling but has made possible more accurate and perfect results. So manifold have been the improvements made in the dental engine and its equipment of accessory appliances that it may, if the operator so desire, be used for every step of the operation from cavity preparation to the finished filling. As the cohesive property of gold, upon which its value in restoring the form of the tooth depends, is at once destroyed by contact with moisture, great difficulty was formerly experienced during large filling operations in excluding the gold from contact with saliva; napkins, bibulous paper and various mechanical devices were used for the purpose, but were often insufficient to prevent the destruction of a filling during the progress of its insertion. The device known as the rubber dam, introduced by Dr. S. C. Barnum of New York, about 1865, solved the problem of effectually excluding moisture from the teeth undergoing the filling operation and made possible more extensive and thorough restorations than had previously been attempted. The discovery of the usefulness of the cohesive property of gold in filling operations soon brought into requisition other means than simple hand pressure for condensing the gold foil into a solid homogeneous mass. It was soon found that greater solidity could be obtained by the percussive force of a mallet applied to the gold through the plugging instrument, so that the use of the mallet became general for the purpose, largely through the persistent advocacy of Dr. W. H. Atkinson of New York. The earlier forms of condensing mallets were simply hand mallets with heads made of various materials and different weights to attain desired variations in the impact and quality of the blow delivered upon the condensing instrument. Later, automatic mallets combining a plugging instrument and mallet were introduced. In these instruments the blow was produced by a hammer propelled by the release of a spring compressed by pressure, the malleting mechanism being contained in a casing connected with the plugging point which was applied to the surface of the filling upon which the impact of the blow was ultimately expended. In 1867, Dr. W. G. A. Bonwill, of Philadelphia, introduced his electromagnetic mallet, an instrument which involved the principle of the Morse telegraphic recorder so modified that the armature of the electro-magnet was effectively utilized as a mallet acting upon the free end of the gold-plugging instrument. With the automatic interrupter of the current afterward added to it the Bonwill instrument contributed greatly to the improvement of gold-filling operations both in the solid-

ity of the gold, its more accurate adaptation to the walls of the cavity, and in lessening the fatigue and discomfort of both patient and operator incident to the operation. The blows delivered by the electro-magnetic mallet while light are extremely rapid, an advantage which its inventor sought to realize in a later device, to be used in connection with the dental engine, known as the Bonwill engine mallet, an instrument of high efficiency and the parent device of many subsequent modifications.

The extensive use of gold as a filling material and the perfection to which the technique of its use for that purpose has been developed, especially in America, has recently brought about a reactive tendency against the display of elaborate operations of gold, especially in conspicuous positions in the front teeth, æsthetic considerations stimulating the search for some substitute more in harmony with the texture and color of human teeth. Recently through the invention of an improved technique by Dr. C. H. Land of Detroit, Mich., and the further investigations of Dr. N. S. Jenkins, an American dentist resident in Dresden, Germany, the use of porcelain as a restorative material has become practically possible and bids fair to supplant gold as a filling, at least in conspicuous situations. The durability of porcelain restorations as compared with gold fillings remains to be tested by time and experience, but the immediate result is in all respects in favor of porcelain, especially in the matter of appearance, which so harmonizes with the teeth structure in color and texture as to be invisible when the operation is correctly performed. The filling of cavities is also extensively done with plastic materials that have the property of becoming hard in the course of time after having been inserted in a soft state. This class of materials includes the amalgams and cements, also gutta-percha. Certain of these materials, the cements for example, serve only a temporary purpose, and their usefulness is therefore of limited duration. The amalgams, however, while unsightly in appearance, are extremely useful; being quite durable and capable of insertion without great difficulty, they can be used in cases of great loss of tooth structure, thus restoring many cases that could not otherwise be as successfully treated, and with less cost than gold filling.

Following the researches of Koch in bacterial pathology, the role played by micro-organisms in the causation of dental diseases became the subject of study by numerous investigators, notably Prof. W. D. Miller, an American dentist resident in Berlin, through whose researches the cause of tooth decay was explained. Similarly the causal relation of disease-producing micro-organisms to disorders of the dental pulp and the tissues surrounding the roots of teeth has been clearly made out, with the result that operations upon the pulp chambers and root canals of teeth in which the pulp has been devitalized by disease or design are now among the recognized conservative operations of dentistry. This advance in the treatment of pulpless teeth has made possible the permanent saving of multitudes of teeth in a condition of comfort and functional usefulness which were previously inevitably sacrificed or lost. Later investigations in the domain of dental and oral pathology are throwing light upon the causes and improving the modes of treatment of those diseases of the retaining tissues of the teeeth which when unchecked result in their early loss by destruction of their attachment to the gums and alveolar sockets.

Dental art has in the development of its operative technique compassed the problem of defective tooth restoration, and has made possible the restoration not only of any portion of a single tooth, but of a whole tooth or any number of missing teeth. Where roots of teeth remain and are not hopelessly diseased or fractured, they form the foundations for that class of restoration known as crown- and bridge-work, the desirability and efficiency of which is directly proportioned to the skill and judgment expended upon its execution.

The grafting of artificial crowns of porcelain upon healthy natural roots is accomplished in a large variety of ways, the attachment being by metallic dowels cemented into the properly enlarged pulp canal of the root, this being in most cases reinforced by means of a gold collar or ferrule connected with the porcelain crown, closely encircling the periphery of the root at and slightly under the gum margin. Perfect adaptation of the crown and root end is obtained by correctly shaping the exposed portion of the root and then fitting to it a thin gold base-plate, to which is adapted the dowel and ferrule, after which the properly fitted porcelain crown is attached to this foundation by gold solder and a backing plate of gold connecting with the platinum pins of the crown. In certain cases hollow crowns made entirely of gold plate shaped to the contour of the original natural crown are used upon the roots of the grinding teeth instead of porcelain crowns, as they possess the advantage of superior durability. Aggregations of crowns permanently united upon their contiguous surfaces and supporting crowns in spaces where teeth have been extracted constitute so-called bridge work. No restorative operation in dentistry requires more judgment and skill, nor has any dental procedure been more abused in its performance than bridge work. Where the operation is intelligently and skilfully done, it constitutes the most satisfactory result both as to comfort, utility, and appearance, that prosthetic dentistry has yet attained; otherwise it defeats the very object for which only it should be undertaken, namely, the restoration of the denture to full functional usefulness and æsthetic appearance.

The department of dentistry technically known as mechanical or prosthetic dentistry comprises all those operations and the laboratory manipulation of the materials involved in the construction of substitutes for lost dental organs and parts of the oral tissues. Where lost teeth are to be replaced by means other than those described as crown and bridge work, it is done by mounting the porcelain crowns upon a base-plate adapted to the surface of the alveolar ridge and in the upper jaw usually to the surface of the palatal vault as well. An impression of the alveolar arch is taken in an impression tray containing a plastic material, which will subsequently harden, usually plaster of Paris or a modeling compound consisting of gum kauri, stearin, and talc; beeswax or beeswax and gutta-percha have been used, but are now practically abandoned for this purpose. Into the matrix formed by the impression a batter of plaster of Paris is poured, which after it has

hardened forms the cast upon which the base-plate to support the artificial teeth in the mouth is constructed. The base plate may be of vulcanite or of metal, and in the former case the porcelain teeth are adjusted to the cast by means of wax, and a wax plate is constructed which is the counterpart of the projected finished vulcanite plate. When the arrangement of the teeth to the wax trial plate has been found to be satisfactory by actual trial in the mouth of the patient, it is returned to the cast and the whole embedded in plaster of Paris contained in a sectional iron vulcanizing flask, similar in construction to the molding flask of the brass or iron founder. The upper and lower sections of the flask are separated after the investing plaster of Paris has fully hardened, and the wax is completely removed by a stream of boiling water, leaving a facsimile matrix in the plaster, which is then packed full of vulcanizable caoutchouc; the flask is then closed, and after being firmly bolted together is subjected to the action of the heat from superheated steam for about an hour at 320° F. in a vulcanizer. The case is allowed to cool, and when removed from the matrix the now thoroughly hardened plate is finished with a fine polish and is ready for insertion in the mouth. Metallic plates serving as the base of support for artificial teeth are constructed by stamping or swaging the flat plate cut approximately to the desired pattern, between male and female dies made from zinc and lead respectively, which have been obtained by casting the molten zinc into a sand matrix made from the plaster of Paris model of the alveolar arches. This furnishes a zinc model or male die, upon which a female die or counter-die of lead is cast, and between these the metallic base-plate is struck up to the form of the alveolar arch upon which it is intended to rest. Upon this base-plate porcelain teeth are fitted and attached by a metallic connection between the platinum pins (which for the purpose are baked in the porcelain texture of the artificial teeth) and the base-plate, union being made by soldering. Dentures upon an enameled platinum base-plate constitute a form of work known as continuous gum work, in which, after the teeth by means of their pins have been united to the plate by soldering with pure gold, porcelain paste or "body," as it is technically called, is packed around the roots and between the teeth; then carved into form until the natural contour is reproduced. The piece is then subjected to high heat in a muffle until vitrified, after the manner of firing or baking china or pottery. It is next given a coating of enamel in imitation of the natural gum color, and after this has been fused in the muffle and the piece finally finished, it constitutes the most artistic, hygienic, and anatomically perfect denture of which dental art is capable.

The prosthetic department includes, besides the restoration of lost teeth, the construction of mechanism for the correction of palatal defects, whereby imperfect speech and deglutition are restored to practically normal condition; it includes also the construction of splints in the treatment of fractures of the jaws and the restoration of parts of the jaws lost by accident or disease; construction of mechanism for the correction of irregular positions of the teeth and for the restoration of facial deformities due to irregular or imperfect development of the jaws and bones of the nasal or facial regions. The correction of irregularities in the position of the teeth has developed such importance and covers such a wide field of study and work as to constitute a distinct specialty of modern dental practice. This department of dentistry is termed *orthodontia;* its importance is due not only to the cosmetic value of its results, but because of the direct bearing which irregular positions of the teeth and deformities of the dental arches exert upon the bodily health.

The whole field of dental and oral pathology has been so far developed by study and research as to place modern dental practice distinctly among the recognized specialties of the healing art. Most of the bacteria causing general bodily disease find access to the system through the mouth, which is also the habitat of many bacteria, benign and disease-producing as well. Hence the hygienic care of the mouth as a protection against disease invasion is of the utmost importance. Late researches have shown that the mouth, its tissues and its secretions, and the teeth themselves, furnish important indications of certain bodily diseases, malnutrition, etc., which are extremely valuable as diagnostic means. The training of the dental practitioner has therefore been enlarged so that in the foundation elements it is now coextensive with that of the practitioner of general medicine, but specialized with reference to its particular field of inquiry.

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Edward C. Kirk,
Editor 'Dental Cosmos.'

Dentistry in the United States. From the earliest times dentistry was practised as a branch of surgery. Herodotus speaks of means of preserving the teeth, and artificial teeth are alluded to by Greek and Latin poets. Within the last half century dentistry has become a distinct profession. The Baltimore College of Dental Surgery, established in 1830, was the first institution of the kind in the world. It was the direct result of an agitation to put dentists on a higher professional plane, and followed an unsuccessful attempt to found dental chairs in medical schools. It had been argued that oral pathology and dental mechanics should be taught in the medical schools as branches of medicine and that graduates choosing these courses should receive the degree of M.D. as in the case of other branches of medicine. In the same year the 'American Journal of Dental Science,' the first dental periodical in the world, was established. In 1845 the Ohio College of Dental Surgery (since 1888 the dental department of the University of Cincinnati), in 1856 the Pennsylvania College of Dental Surgery, in 1863 the Philadelphia Dental College were founded. These separate schools taught at first very little medicine, but paid attention almost

entirely to mechanical training and to those branches which a dentist must know. All conferred the degree of D.D.S. In 1865 the New York College of Dentistry was founded with the purpose of educating men to practise dental surgery as a specialty of medicine. The curriculum included the fundamental departments of medicine with operative dentistry and oral prosthetics. In 1867 Harvard University opened a dental department and began to teach dentistry as a branch of medicine with the special degree D.M.D. (*Dentariæ medicinæ doctor*). In 1875 the University of Michigan and in 1878 the University of Pennsylvania followed the example of Harvard in opening dental departments. Forty of the 56 dental schools are now departments of other institutions. Since 1878 there has been a most astonishing increase in dental schools and dental students, due largely to the fact that the dental laws in many States now require graduation from a dental school as a condition for license. In 1878 there were 12 schools and 701 students; in 1902 there were 56 schools and 8,420 students. The number of practitioners of dentistry at present in the United States is about 27,000; upward of 60 institutions are devoted to the systematic education of dentists; the profession has an extensive literature of standard works and periodical publications, and the furnishing of supplies and material used in dental practice is an enormous industry involving millions of capital, a growth which has all developed within 60 years.

In 1840 the American Society of Dental Surgeons, the pioneer of the associations to which dentistry owes so much of its progress, was organized in New York. The National Association of Dental Faculties, organized in 1884, has done much to strengthen courses of study in dental schools. At the time of its organization only those schools were admitted which had proper facilities for instruction and a corps of competent teachers. From time to time standards have been raised by rules governing attendance, instruction, and graduation. There are at present 51 schools in the association, all of which require three full courses of dental lectures. The main defect of these schools as a rule is failure to require a sufficient preliminary general education for admission. The National Association of Dental Examiners was organized in 1883 to secure higher and more uniform standards for admission to dental practice. The entrance requirements of these associations are equivalent to at least two years of high school work.

In Alabama, in 1841, the first State law regulating the practice of dentistry was enacted. This was probably the first dental legislation in any country. The next State to pass a dental law was New York, but this action was not taken till 1868. The English law was enacted in 1878, and those of other countries about that time or later.

Supervision.— The practice of dentistry is now regulated by statute in 52 political divisions of the United States.

In Alaska and Indian Territory, no statutory enactments are given. Examinating boards are appointed in Alabama, Kentucky, North Carolina and South Carolina by the State dental associations; in District of Columbia by district commissioners; in Indiana by the governor, State Board of Health and dental association; in Nebraska by State Board of Health; in New York by the University of the State of New York; in Philippines by the Board of Health; in the remaining divisions by the governor, on recommendation, usually, of the state dental societies.

Licensing.— Interchange of licenses is highly desirable and will doubtless be brought about to some extent in the near future. An important step toward interchange of licenses was taken in 1898 when the New York dental law was amended so that the Regents may now issue their license to any applicant who holds a license to practise dentistry granted by a State board of dental examiners, indorsed by the Dental Society of the State of New York, provided that his preliminary and professional education meets the New York statutory requirements. The dental examiners of Pennsylvania having been indorsed by the New York State dental society and recommended by the State dental examiners, the regents indorse Pennsylvania licenses granted under the new régime.

Licentiates of Other States.— Indiana admits licentiates of other States having equal requirements on "signification of reciprocal courtesy"; Illinois on approved diploma from reputable dental or medical college, or on 10 years' practice; New Jersey and Pennsylvania, on proof of license from other State boards having equal requirements; New Mexico and Utah, on proof of diploma recognized by National association dental examiners; New York, on proof of license from another State board having equal requirements and indorsed by the New York State dental society, or on graduation from a registered dental school and six years' practice; District of Columbia, Louisiana, Michigan, Missouri, Nebraska, Nevada, North Dakota, Oklahoma, South Dakota, Tennessee, Wisconsin, on approved diploma from other States; Kansas, Kentucky, Ohio, Texas, on approved diploma from a dental college in the United States or any foreign country. In the remaining political divisions no provision is made in the law for admission of licentiates of other States.

Synopsis of Requirements, Jan. 1, 1904.— In 33 divisions dental diplomas do not now confer the right to practise, an examination being required in all cases: Alabama, Arizona, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Indiana, Iowa, Maine, Massachusetts, Minnesota, Mississippi, Montana, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Philippines, Rhode Island, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia.

The following require for admission to the licensing examination: Arizona, diploma recognized by N. A. D. E. or four-year high school course and three years' apprenticeship, or five years' practice.

California, diploma of reputable dental school indorsed by State board of dental examiners, or three-year high school course and four years' dental apprenticeship, or certificate of examining board of another State showing five years' practice.

Colorado, diploma from legally organized reputable dental school.

Connecticut, diploma from recognized dental school, or three years' instruction, or three years' practice.

Delaware, diploma of recognized dental school.

Florida, diploma from reputable dental school.

Georgia and Hawaii, diploma from reputable dental school.

Idaho, three years' experience, certificate from another State board, or diploma from legally organized dental school.

Indiana, diploma recognized by N. A. D. E., or five years as assistant to licensed dentist.

Iowa, diploma from reputable dental schoool.

Minnesota, diploma from reputable dental school, or evidence of 10 years' continuous practice previous to September 1889.

Montana, diploma of reputable dental school, or five years' dental practice, or five years' study under licensed dentist.

New Jersey, common school education, diploma from recognized dental school or a written recommendation from five experienced dentists.

New York, full high school course, degree from registered dental school or medical degree with a special two-year dental course.

Ohio, diploma from legally chartered dental school.

Oregon, diploma from dental school in good standing, or study and practice in Oregon prior to this act

Pennsylvania, three-year high school course, diploma of recognized dental school.

Philippines, diploma from legally incorporated dental school.

Utah, diploma recognized by N. A .D. E., or two years' practice or three years' study with licensed dentist.

Virginia, a fair academic education.

Washington, diploma from recognized dental school.

The following require the licensing examination only:

Alabama, Maine, Massachusetts, Mississippi, New Hampshire, North Carolina, Rhode Island, South Carolina, Vermont, West Virginia.

In the following political divisions either approval of dental diploma or examination by State or other duly qualified board is required:

District of Columbia, Illinois, Kansas, Kentucky, Louisiana, Maryland, Michigan, Missouri, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, Tennessee, Texas, Wisconsin.

The following, requiring either approval of diploma or examination, admit to examination:

Missouri, three years' study with legally registered dentist or license from another State.

North Dakota, three years' active practice or three years' study with practitioner.

South Dakota, three years' practice or three years' study with practitioner.

Wisconsin, diploma from approved incorporated dental school or four years' practice or five years' apprenticeship.

One State, Wyoming, requires only presentation of diploma to unqualified local officers.

Porto Rico admits to practice on diploma approved by the superior board of health.

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Dentists. About the time of the Revolutionary War, dentists came to the United States from England and France. They included Woffendale, who arrived in 1700; Gardette, a French surgeon, 1778; and Lemaire, a French dentist, 1781, who accompanied the Comte de Rochambeau's army. While the Continental forces were in quarters at Providence, R. I., during the winter of 1781–2, Lemaire found opportunity for the practice of dentistry and also for the instruction of one or two students, particularly Josiah Flogg, who commenced practice in 1782, and was, so far as can now be ascertained, the first American dentist. John Greenwood, who became a practitioner about 1784, made sets of artificial teeth for General Washington. American dentists have made important contributions to the progress of dentistry. The dental engine, in its original form, was devised by Morrison in 1846. About 1855 Arthur discovered that gold-foil, which had previously been without cohesiveness, might be made cohesive by being passed through an alcohol flame. Atkinson first recommended the mallet as aid to the filling of teeth with gold. Barnum invented (1864) the rubber dam, which protects the field of operation from moisture during filling, and is also a means of excluding bacteria. Its value has been found to be decided. Richardson was the earliest to advocate (1857) the employment of a galvanic current as a means of inserting drugs into the tissues, though this method has been applied only comparatively recently. Wells discovered the application to dentistry of nitrous oxide, commonly known as "laughing gas." This is the anæsthetic now generally employed for extraction. Charles Goodyear in 1855 obtained in England a patent for a process of making a dental plate of hard rubber (caoutchouc). Artificial teeth were secured in this as a support before its vulcanization. Patents were also secured on subsequent improvements, and the vulcanite base has been of considerable benefit. The enameled platinum denture, used in what is sometimes styled the continuous gum method, was perfected by Allen in about 1846–7. By this method porcelain teeth are secured to a base-plate of platinum; a porcelain paste is then applied to the plate and covered with vitreous enamel. Mention should be made of the researches of Andrews, Black, and Sudduth in dental science. Numerous authoritative works on dental practice have been written and published in America. A 'History of Dental and Oral Science in America' (1876) was published by Dexter. Consult also Wedgwood, 'Progress of Oral Surgery' (1891).

Dentition, including both the formation and the cutting of the teeth, is one of the most important organic processes of childhood and adolescence. The pulpy nucleus constituting the tooth germ appears about the third month of pregnancy, and at the end of it the jaws contain the 20 follicles which are to produce the first teeth. Those of the second dentition appear from the fifth to the ninth month of fetal life, but some do not appear before the end of the second year. The first teeth are usually cut in the last six months of the first year. The central incisors of the lower jaw show themselves first, then come incisors of the upper jaw; the other teeth follow, proceeding in order from the centre backward, except in the case of the canines, which in general make their appearance only be-

fore the four last molars. The number of teeth is then 20. All are temporary and are replaced by those of the second dentition. The first dentition is usually completed during the last months of the second year. In some instances children have been born with teeth, and in many instances the first teeth do not make their appearance till after the 10th or even the 12th month. At the age of 6½ to 7, secondary teeth commence erupting and the first permanent molar, called the six-year molar, makes its appearance. At the same time the roots of the temporary teeth being resorbed the teeth themselves become loose, fall out, and are replaced in the same order as at the original cutting. The renewal of the incisors commences about the seventh and is not completed till the ninth year. Toward the 10th year the first permanent molar or bicuspid appears, next the canine, and then the second bicuspid. The bicuspids are of less size than the molars which they replace, the incisors and canines on the contrary are larger. On the regularity of these proportions depends the greater or less facility in the arrangement of the teeth subsequently cut. From 10½ to 11 years the second great molars appear, and last of all, usually from 18 to 25, the teething is completed by the cutting of the last molars or wisdom teeth. Besides the differences already mentioned between the first and second teeth, the incisors of the latter present on their anterior face two salient lines parallel to the axis of the tooth, and the roots of all of them are larger than those of the former. When the dental process is being performed the bones, which are its site, receive a development proportioned to the augmentation of the teeth in number and volume.

D'Entrecasteaux Islands, dän-tr-käs-tō, since 1884 part of the British protectorate of New Guinea, lie north of the southeast extremity of New Guinea; area 1,083 square miles. They comprise three chief islands separated by narrow channels. They are named after the French admiral and explorer, Bruni D'Entrecasteaux (1739–93), who visited these waters in 1792. His name is also preserved in D'Entrecasteaux Point on the southwest coast of western Australia; and in D'Entrecasteaux Channel, separating the south of Tasmania from Bruné Island. The islands contain boiling springs and other indications of volcanic action. The natives though described as head hunters are said to be skilled agriculturists.

Denudation, the laying bare of underlying rocks by the removal of superficial matter, and also the process by which the earth's surface is broken up and the loose material carried away, chiefly by the action of wind, rain, running water, frost, snow, ice, the sea, plants, and animals. The action of wind is seen in the erosion of rocks produced by the sand and grit which in certain dry regions is swept by the winds against projecting rocks, an action often resulting in the undermining of cliffs and the downfall of rock-masses. Rain is also a potent agent of denudation, its action being both chemical and mechanical. Rocks are more or less altered and decayed, and the decomposed materials carried off in solution by rain-water. In many places the rocks are thus "weathered" to considerable depths, the decomposed crusts varying in thickness from a mere line up to many feet or even yards. The mechanical action of rain consists chiefly in the sweeping away of this disintegrated material. Running water acts also chemically and mechanically. Thus, the rain that sinks underground and rises to the surface again in springs, brings about many changes in rocks. Immense quantities of mineral matter are brought up in solution, and thus, in time, underground cavities are formed, especially in the more soluble rocks. In regions of calcareous rocks, the whole drainage is sometimes conducted underground. This action of underground water often brings about local subsidences, falls of rocks, and great landslips. The denuding action of superficial terrestrial waters is seen in the excavation of gullies, ravines, and river-valleys, one of the most remarkable examples of river erosion being the Grand Cañon of the Colorado (q.v.).

Frost acts with great intensity at high levels and in high latitudes, but even in temperate regions its action is very marked and productive of great disintegration of rocks. Glaciers are likewise powerful denuding agents. They are not only instrumental in transporting the rock-rubbish which is showered down upon them from overhanging cliffs, etc. (see BOULDERS), but by means of the blocks and debris which they drag forward on their beds, they grind, furrow, and smooth the rocks over which they flow. The sea, again, acts like a great horizontal saw, which is continually rasping away the rocks along the coast.

Nor can the destructive action of plants and animals be ignored. Plants send their roots into rock-crevices and wedging the masses asunder, aid the freer percolation of water, and prepare the way for the better action of frost. The destructive action of animals, again, is seen in the weakening of rocks on a sea-coast produced by the drilling and boring of Saxicava, Pholas, etc., and by annelids, echini, and sponges. Rocks so weakened fall more readily before the battering of waves and breakers. Little change may be perceptible, but an examination of the rocks shows that many thousands of feet of solid strata have been gradually removed from the surface of a country. Thus, in many districts where faults occur, no inequality at the surface betrays the presence of dislocations; the whole area has been reduced by denudation to the same level, hundreds or even thousands of feet of strata having been removed from the upcast side of the faults (see DISLOCATION). Denudation proceeds more rapidly in some regions than in others; therefore, the work of no individual river can be taken as a standard by which to estimate the general rate of erosion. Much depends on physical and climatic conditions, and much on the geological structure of a country and the composition of its prevalent rock-masses. Thus, the Mississippi is said to remove from the general surface of its basin one foot in 6,000 years, the Rhone one foot in 1,528 years, the Po one foot in 720 years. Rivers like the Rhine, the Danube, the Elbe, and the Rhone, contain in every 6,000 parts by weight one part of dissolved mineral substance. These rivers, therefore, carry seaward their own weight of dissolved matter in 6,000 years. Consult: Playfair, 'Illustrations of the Huttonian Theory'; Lyell, 'Principles of Geology'; Croll, 'Climate and Time,' and the standard text-books of geology.

Denver, James W., American soldier and frontiersman; b. Winchester, Va., 1817; d. 9 Aug 1892. He removed to Ohio with his father in 1830, where he studied for the bar. Later removed to Missouri, where he raised a company and served in the Mexican war. In 1850 he went to California where he became prominent in politics and was elected secretary of state, and afterward elected to the 34th Congress. Before the end of his congressional term he was appointed commissioner of Indian affairs, but resigned to accept the office of governor of the Territory of Kansas. He returned to Washington after 12 months of service leaving the territory well organized and law-abiding. He returned to California in 1859, but soon after removed to Wilmington, O. He served in the Union army during the Civil War until 1863. Gen. Denver suggested the name Colorado for the Territory formed out of Kansas, and the city of Denver was named in his honor.

Denver, the capital of the State of Colorado, organized 17 Nov. 1858, and named in honor of Gen. James W. Denver, the first governor of the Territory of Kansas, which at that time included Colorado in its limits. It is 2,025 miles from New York; 1,457 miles from San Francisco; 639 miles west of Kansas City; 538 miles from Omaha; and is the chief metropolis of the entire Rocky Mountain region between the Missouri River and the Pacific coast. Its area is 54 square miles and its population is about 175,000; is the principal smelting centre in the United States, and its prosperity reflects the growth of the entire State, which produced (1902) gold, $28,762,036; silver, $12,488,774; lead, $7,770,196; copper, $1,293,011; total, $50,314,019. The taxable property in Denver amounts to $133,686,076, and its net public debt $4,052,199. Denver lies at an altitude of one mile above the sea. The site is about 10 miles east of the base of the foot-hills of the Rocky Mountains in the valley of the south fork of the Platte River, at its junction with Cherry Creek, a dry stream, which carries running water only at intervals.

The climate of Denver is one of the most delightful and remarkable in the country. The data for the years 1897 to 1901 from the United States Department of Agriculture gives the following information: "Discarding fractions of a degree, the mean annual temperature at Denver is 50°, as against 48° at Chicago, 49° at Boston, 55° at Washington, 56° at St. Louis, and 69° at Jacksonville. During the last 32 years, 100° or higher has been touched just 13 times in Denver — 7 times in July and 6 in August. While these high temperatures were maintained only for a few minutes, readings in the 90's are common during every summer month. For July, the warmest month, the average temperature is 72°, and the average daily maximum, or afternoon reading, is 87°. Here, as elsewhere, over the greater part of the United States, the coldest month is January, with an average temperature of 29°. The annual precipitation, which includes rain, snow, sleet, and hail, is 14.00 inches. Chicago, 34.8; St. Louis, 41.1; Washington, 44.8; Boston, 45.0; and Jacksonville, 54.1. Of sunshine Denver has 69 per cent of the possible, as against 65 at St. Louis, 59 at Washington, 54 at Boston and 53 at Chicago. The average relative humidity is slightly below 50 per cent. It is highest in February, 55 per cent, and lowest in June, which has an average of 40 per cent. Twice during my residence of 21 years in the State have we observed a humidity as low as one half of 1 per cent. The annual relative humidity at St. Louis is 70 per cent, Boston 72, Washington 73, Chicago 77, and Jacksonville 80, and for the warmer months — June, July, August, and September — at St. Louis 66 per cent, Chicago and Boston 74, Washington 76, and Jacksonville 82. It will be observed that in the Atlantic States the humidity during the warm months is greater than the annual, just the reverse of that which obtains at Denver. In brief, Denver summers are characterized by warm days and cool nights, the heat of the day not attended by the usual debilitating effects; the winters by an abundance of sunshine, and the general absence of snow and of severe and long continued cold."

The public utilities of Denver are modern in every particular. The street cars of the city, which are operated by the overhead trolley system, cover some 150 miles of streets, and carry each year over 50,000,000 passengers. Gas and electric light and electric power are furnished by the Denver Gas and Electric Company. The Denver City Steam Company supplies many business buildings with steam-heat, and operates 10 miles of pipe line. Telephonic communication is had between Denver and 227 of the principal towns in Colorado, Wyoming, and New Mexico. Denver's supply of water is furnished by the Denver Union Water Company, which takes its water from the Platte River, Bear Creek, and Cherry Creek. The greater portion of the waters are taken during the non-irrigating season and stored in large and extensive reservoirs. The waters from these reservoirs percolate through natural filter beds of sand, before entering the city mains. Probably no city in the world possesses better drinking water. As a commercial city Denver is increasing in importance each year. In manufacturing it produced in 1890 some $30,000,000 worth of products; in 1902 $48,750,000 represents the value of goods made in this city. As Denver's trade territory increases in population, its jobbing trade also increases, and in round numbers the wholesalers of this city sold in 1902 approximately $50,000,000 worth of goods. Denver's banking and financial institutions are strong. The five national banks of the city reported their deposits for 1902 as amounting to $43,852,605.

No educational advantage is denied any pupil in Denver's free schools. They start with the children in the kindergarten and carry them through 12 grades ready to enter college, or with a fair education in all branches of study if school life is to end with the public school. Besides the regular grammar and high school studies, the children may have manual training, special training in cooking and sewing, modern and ancient languages, music and drawing, with special preparation for advanced work in technical schools. The school property is valued at about $4,000,000; annually there is spent for maintaining the schools about $800,000. In addition to the city library are a medical library, several thousand volumes, six law libraries, school libraries containing 60,000 volumes,



DENVER, COLORADO.

exclusive of text-books, and at the capitol building a State library numbering over 15,000 volumes.

Denver has 4 daily newspapers, 35 weekly papers, and a number of trade journals. The city has 12 parks, with a total area of 550 acres, the largest, the city park, contains 320 acres. Denver has 156 church buildings. The public works have kept pace with the advance in other directions. Extensive storm and sanitary sewer systems, carefully graded, curbed, and paved streets, uniform sidewalks of first-class material, and massive steel viaducts are some of the indications of the progress. In 1902 there were 62 miles of sidewalks laid and 45 miles of streets graded and rounded ready for paving or surfacing. The estimated cost of the improvements now under way in 1903 amounts to $1,068,338.

Several great transportation companies centre in Denver, four of which continue across the continent and one, the Denver, Northwestern & Pacific Railroad, now in construction, will make the fifth. The Union Pacific Railway takes its passengers through Denver to the western coast by the way of Cheyenne and Ogden; the Burlington and Rock Island transfer their passengers to the Union Pacific, Rio Grande, or Santa Fé for continuance of the journey. The Santa Fé, whose main line extends south of Denver across the continent through New Mexico and Arizona, makes southern connection for Denver. The greatest transportation enterprise of recent years is the construction of the Denver, Northwestern & Pacific Railroad. By this road the distance between Denver and Salt Lake will be, when completed, 100 miles shorter than by any other route.

AARON GOVE,
Ex-Superintendent of Schools.

Denver, University of, a coeducational institution, in Denver, Col.; founded in 1864 under the auspices of the Methodist Church. Until 1880 it was called Colorado Seminary. The university is now composed of seven colleges; three of the departments are at University Park, a suburb of Denver; and four in the city. The Chamberlin Observatory, which has a very large telescope, is at University Park. In 1902 there were connected with the university 133 professors and instructors and 1,167 students.

Deobund, dē'- or dā'ō-bŭnd, or **Deoband,** India, city in the Saharunpur district, Northwest Provinces; an ancient place, with manufactures of fine cloth and a grain trade. It has many temples, and is much resorted to by pilgrims. Pop. 19,250.

Deodand, dē'ō-dănd (*Deo dandum,* a thing to be given or dedicated to God), an obsolete legal term for anything that had caused a person's death, all such chattels being, by the old rule of the common law of England, forfeited to the king, to be devoted by him to pious uses, though often finding way to his privy purse. In all indictments for homicide, the grand-jury specified the instrument that immediately caused the death, and its value, that the king might claim the deodand and distribute it "to appease God's wrath." Though these forfeitures were originally incurred to the king, yet they were frequently granted to the lord of the manor or territory upon which the death happened. Deodands were abolished in 1846. There has never been anything analogous to this custom in the United States.

Deodar, dē-ō-dăr' ("divine tree"), from the Sanskrit *devadaru*), a tree (*Cedrus deodara*), a native of the mountains of India, where it grows to the height of 100 feet and upward. It chiefly resembles the cedar of Lebanon in habit of growth, and is probably a species of the same genus. The timber is among the most valuable grown in India. The name is rather freely applied to trees, especially to species of the *Coniferæ*. See CEDAR.

Deo'dorizer, a substance used for absorbing foul-smelling gases, or for substituting an odor which is pleasing for one that is disagreeable. Deodorizers are not disinfectants or antiseptics, and should not be confounded with them. They are of no use save to cover up disagreeable smells, and often do a great deal of harm by shutting people's nostrils to real signs of danger.

De Officiis, dē o-fĭsh'ĭ-is (Lat. "of duties"), a treatise in three books by Cicero, on moral obligations written about 44 B.C.

Deogarh, dē'- or dā'ō-gŭr, India, the name of several cities, of which the following two are the chief: 1. In Bengal, 170 miles northwest of Calcutta; it contains a group of temples to which numerous pilgrims resort. Pop. 8,667. 2. In Oodeypore, Rajputana; its chief attraction is an old palace. Pop. 7,400.

D'Eon de Beaumont. See EON D' BEAUMONT, CHARLES.

De Oratore, dē or-ą-tō'rē (Lat. "on the orator"), a rhetorical work by Cicero, in three books, written about 55 B.C. It is in the form of a dialogue, the principal characters being L. Crassus and M. Antonius. The work ranks with the most finished productions of Cicero on account of its varied contents and its excellent style.

Department, the name given certain territorial divisions of countries, especially to the principal territorial divisions of France. At the time of the French Revolution, when the former division of the kingdom into provinces was abolished, and succeeded by a division of it into departments, this division was determined partly by the number of inhabitants, partly by extent of territory, and partly by the amount of direct taxes. The new division was proposed in the Constituent Assembly in 1789, and effected in 1790. The whole kingdom was at first divided into 83 departments, which were subsequently increased by the gradual extension of the empire to 130, and were reduced by the Peace of 1814 to 86. By the cession of Savoy and Nice to France in 1860 the number of the French departments was increased to 89, and by the cession of Alsace-Lorraine to Germany in 1871, the number was reduced to 87. Most of the states of South America are also divided into departments (*departimientos*), but these resemble the French ones in nothing but the name. Each French department is subdivided into arrondissements, these again into cantons, and these again into communes. The name is, also, applied to military divisions, and to various other divisions as of government and schools.

De Pauw, Washington Charles, American manufacturer: b. Salem, Ind., 4 Jan. 1822; d. New Albany, Ind., 5 May 1887. He received a liberal education, worked himself up to the foremost rank among the business men of his State; and was successively a mill-owner, a merchant, and a banker. He was noted for his extensive gifts in behalf of education. His aid to the Indiana Asbury University set it upon a sound basis, and its name was changed to De Pauw University in his honor. He also founded De Pauw College for Women, and several charitable institutions at New Albany, Ind. See DE PAUW UNIVERSITY.

De Pauw University, a coeducational institution in Greencastle, Ind.; founded in 1837, under the auspices of the Methodist Episcopal Church, and known as the Indiana Asbury University until 1884, when the name was changed to De Pauw University. In 1902 there were in attendance 515 students with 29 professors and instructors; number of volumes in library 17,500; grounds and buildings valued at $300,000; productive funds, $290,000; benefactions, $7,500; income, $28,500; number of graduates, 2,110; president, H. A. Gobin, D.D.

De Pere, dē-pēr' or dē-pār', Wis., city in Brown County; on the Fox River at the head of steamer navigation, and on the Chicago & Northwestern, and the Chicago, Milwaukee & St. Paul railroads, about 100 miles north of Milwaukee. Pop. (1900) 4,038.

Depew, Chauncey Mitchell, American lawyer, legislator, politician, and orator: b. Peekskill, N. Y., 23 April 1834. He was graduated from Yale College in 1856, studied law in Peekskill and in New York, and was admitted to the bar in 1858. He was soon after elected to the New York Assembly, and served as chairman of the committee on ways and means. For a time he was acting speaker of the house. In 1863 he was nominated upon the Republican ticket for secretary of state, and was elected by over 30,000 majority. In 1865 he declined a renomination. President Grant tendered him the Japanese mission about this time, but Dr. Depew declined the office, to enter the service of the New York & Harlem Railroad, as attorney. In 1869, when the consolidation occurred of the Hudson River, Harlem and New York Central R.R's he was made a director and attorney for the newly organized company.

In 1872 he accepted the nomination for lieutenant-governor on the Republican State ticket, but was defeated by a small plurality. In 1875, he became general counsel for the entire Vanderbilt system of railroads, and in 1882, second vice-president of the reorganized New York Central & Hudson River Railroad, and president in 1885. The same year Yale College conferred upon him the title of LL.D. During this period he was acting as a regent of the State University. He remained president of the New York Central until 1898, when he became chairman of the board of directors of the Vanderbilt system, which included the New York Central & Hudson River; Lake Shore & Michigan Southern; Michigan Central, and the New York, Chicago & St. Louis railroads.

His political career during these later years was eventful. In 1885 he declined the election to the United States Senate. In 1888 he figured prominently as a candidate for the presidential nomination at the National Republican Convention, withdrawing from the contest in favor of Benjamin Harrison of Indiana, who, after his election and elevation to the presidency, tendered to Mr. Depew the portfolio of secretary of state, which was declined owing to large railroad interests. In 1899, on 17 Jan., he was elected to the United States Senate as junior member from New York State. Since 1885 Dr. Depew has been regarded as one of the leading Republicans of the country. Dr. Depew was married in 1871 to Elise Hegeman, who died 1893, leaving one son. He was married again in 1902 to Miss Palmer.

Dr. Depew's fame abroad is even greater than in the United States. In London and Paris he is regarded as America's representative citizen, and is interviewed and dined accordingly when he makes his annual summer pilgrimage to Europe. This world-wide fame rests largely upon his ability as orator, after-dinner speaker, and lecturer. He delivered important addresses at the Washington Centennial at New York in 1889, and the dedication of the World's Columbian Exposition, at Chicago, in 1893, and orations at the memorial services of President Garfield and General Sherman. As a wit and humorist, Dr. Depew has acquired a name second to none in this country, and he has been in great demand for many years at annual dinners and banquets, as the chief after-dinner speaker. He has published collections of his orations and after-dinner speeches in one volume (1890), and his later speeches (1894). Consult: Clemens, 'Depew Story Book' (1898).

De Peyster, dē pīs'tėr, **Abraham,** American merchant: b. New York 8 July 1658; d. there 10 Aug. 1728. He was the eldest son of Johannes DePeyster (q.v.); and filled many important public offices after the final cession of the New Netherlands to Great Britain. Between 1691 and 1695, he was mayor of New York, and subsequently became chief justice of the province, and president of the king's council, in which latter capacity in 1701 he acted as colonial governor. He was also colonel of the forces of New York, and treasurer of the provinces of New York and New Jersey.

De Peyster, Arent Schuyler, British military officer: b. New York 27 June 1736; d. Dumfries, Scotland, November 1832. He was a grandson of Abraham DePeyster (q.v.). In the American Revolution he was a colonel in the Royal army; was at different times in command of the British posts of Detroit, Mackinac, and elsewhere in Canada.

De Peyster, Johannes, American colonial merchant: b. Haarlem, Holland, 1600; d. New York about 1685. He was one of the early settlers of New York; and became prominent in public affairs during the Dutch possession; was one of the last to swear allegiance to the Crown after the English succeeded to the government; served several times as alderman and deputy mayor, and was frequently urged to become mayor by the English residents, but declined from ignorance of the language.

Depil'atories ("I pull out the hair"), applications used to remove the hair from the body, especially the face and scalp, without injuring the texture of the skin. Quicklime and or-

piment are the most common ingredients. The most celebrated depilatory is the *rusma*, used by Oriental nations, which consists of quicklime and orpiment (tersulphuret of arsenic) boiled in water impregnated with a strong alkaline lye. The parts which are to be deprived of hair are rubbed with this mixture, and after a time washed in warm water. This depilatory acts with great energy, and the utmost care is necessary in using it that it may not irritate and injure the skin. Sometimes a plaster of pitch and rosin is used for the same purpose. The best and most effective means of removing the hair to-day is by means of a galvanic current, and needle electrode, which is applied directly to the hair-follicle, thus killing it. This procedure is sometimes called electrolysis.

Depo'nent, (1) in grammar, a verb which is passive in the conjugation of its tenses, but is not construed according to the usual passive English form. The old grammatic fiction was that such a verb laid aside (*deponens*, laying aside) its passive meaning, but, though somewhat convenient as an aid to classification, this explanation of the form is logically and philologically unsound. (2) In law, a person who depones or makes a deposition; one who gives his testimony in a court of justice; a witness upon oath. See DEPOSITION.

Deposing Power of the Popes, their power, on whatever ground based, to depose sovereigns from their thrones and to annul their subjects' obligation of allegiance. It was the universal belief of the Christian world in the Middle Ages, that if a Christian prince fell into heresy and persisted therein against the admonitions of the Church, the pope might lawfully excommunicate him and procure his deposition, invoking the aid of orthodox princes and of the offender's subjects in making the decree of deposition effective. Such was the consentient teaching of divines and canonists, of church councils and of popes, though not laid down with all the formalities requisite to make such papal supremacy an article of faith. Of course the sovereign against whom the decree was fulminated usually protested and denied the pope's right to depose, or at least denied the justice of the grounds on which the decree was based, still his resistance to the Pope was regarded as rebellion against the decision of the highest court of Christendom. The Lateran council of 1215 directs that if a sovereign persists after warning in letting heresy grow and spread in his dominions, the bishops of the realm should excommunicate him. If he heeds not that judgment, the Pope is to be advised of that fact to the end that he may "declare the vassals of that prince absolved from their allegiance, and invite Catholics to occupy the country." The proceeding was in entire accord with the law of nations as understood in those times; and emperors and kings were crowned and consecrated on the understanding that they held their scepters subject to just such conditions. As Fénelon says, "The Church neither deprived nor appointed lay rulers, but only replied, when the natives consulted it, explaining what concerned the conscience in regard to the political contact or the oath. This is not," he continues, "a juridical and civil, but only a directive and ordinative power." The most explicit assertion of the Pope's deposing power is seen in the celebrated constitution *Unam Sanctam* (1303) of Boniface VIII., who in substance teaches that "both swords, the spiritual and the material, are in the power of the Church, but the latter is to be wielded for the Church, the former by the Church: one by the hands of kings and magistrates, but at the pleasure and sufferance of the priest. One sword must be under the other, and the temporal authority must be subject to the spiritual power." But the claim is no longer made, and the papacy accepts the situation of the Church as it is now, without thought of striving for a return of the ancient order. In the words of Pope Pius IX., "No one now thinks any more of the right of deposing princes which the Holy See formerly exercised; and the supreme pontiff less than any one."

Depos'it, in geology, a layer of soft or hard matter formed by the settling down of mud, gravel, stones, detritus, organic remains, etc., which had been held in suspension in water. Marine deposits are those formed on sea bottoms; lacustrine, those formed at the bottoms of lakes; fluviatile, those formed on river bottoms; and so on. In contradistinction to bed or layer, which is matter more evenly distributed during formation, a deposit is nearly always irregular in form. See GEOLOGY.

Deposit, a term of wide meaning in law, but especially applied to money paid as an earnest or security for the performance of a contract; also to money belonging to one person intrusted to the safe-keeping of another, to be kept without fee, and to be re-delivered on demand. When such a deposit is made to a bank or trading company, interest, according to agreement, is generally paid on it. The person who makes the deposit is called the depositor, and the person who receives the deposit is called the depositary. By the civil law, deposits are divided into two classes, necessary and voluntary. The first class is where the depositor is compelled by some sudden emergency, such as fire or shipwreck, to confide his property to some one, without having opportunity for choosing his depositary. The second class is where the deposit is made by the mutual consent of the parties. Besides such deposits of money received by banking or commercial companies with a view to employing it in their business, a merchant or commercial company frequently deposits with a bank documents, such as deeds or bonds, as security for the payment of a loan.

Deposi'tion, in law, testimony given in court by a witness upon oath; also the written testimony of a witness by way of answer to interrogatories; or affidavit certified by a notary public. When a witness himself can be produced his deposition cannot be read in court.

Deposition of Metals. See ELECTROPLATING.

Depot, dē'pō, Fr. dā-pō, a French word in general use as a term for a place where goods are received and stored; hence, in military matters, a magazine where arms, ammunition, etc., are kept. The term is now usually applied to those companies of a regiment which remain at home when the rest are away on foreign service. In the United States it is the common term for a railway station.

Depres, or Despres, dā-prā, Josquin, zhŏs-kăñ dē-prā, Dutch musician: b. Hainault about 1450; d. Conde, 27 Aug. 1521. He is reckoned

the greatest of the early contrapuntists, but little is known of his personal history. He composed numerous celebrated masses and songs.

Depression, or Dip. See HORIZON.

Depretis, dā-prā'tēs, **Augustin,** Italian statesman: b. Mezzana-Corte-Bottaroni, near Stradella, 31 Jan 1813; d. there 29 July 1887. He was identified with Italian politics from 1849, when he was made civil governor of Brescia, and in 1861 was sent to Sicily as pro-dictator for Garibaldi. He served in a number of the Italian ministries, beginning in 1862 as minister of public works under Ratazzi. Under Ricasoli in 1866–7 he was minister of marine, and afterward held the portfolio of finance. In 1870 he was called to form a ministry himself, and while acting as president of the council and minister of finance he instituted many reforms in the government. In 1879 he resigned, and Carioli formed a government, but Depretis was again placed at the head of the council in 1885, and remained there until his death.

Depriva'tion, the removing of a clergyman from his benefice on account of heresy or misconduct. It entails, of course, loss of all emoluments, but not the loss of clerical character, except it be *deprivation ab officio,* or deprivation of order, which then becomes deposition or degradation. The lighter punishment, simply taking away a clergyman's living or preferment, is called *deprivation a beneficio.*

De Profun'dis, the 130th of the Psalms of David (129th in the Douay version); one of the seven psalms, expressive of sorrow for sin and desire for pardon, used in the liturgy of the Roman Catholic Church, and called the Penitential Psalms. The name De Profundis comes from the Latin version of the first words of the psalm, "Out of the depths." See PENITENTIAL PSALMS.

Deptford, dĕt'fĕrd, England, a metropolitan and parliamentary borough of greater London, formerly a town in Kent and Surrey. In the reign of Henry VIII. a dockyard was established in this place, then known as Deptford Strond. It was in this dockyard that Peter the Great of Russia served as an apprentice and learned ship-building 1691. The London Cattle Market (area 30 acres) occupies the site of the old dockyard. The Royal Victoria Victualling Yard, the largest army and navy supply depot, is located here.

Deputies, Chamber of, the lower of the two legislative chambers or second house of national parliament in France, Italy, Spain, Portugal, and Rumania. The first French Chamber of Deputies was established under Louis XVII. in 1814. By enactments introduced in 1830, any citizen of 30 years and upward who paid direct contributions to the extent of 500 francs might be elected as a deputy. Originally the chamber was elected for five years, in 1824 it became septennial, and in 1830 it was again limited to five years. In France (1903) the chamber consisted of 591 members, elected for four years by universal suffrage. In Italy the members numbered 508; in Portugal 148; in Rumania 183. In Spain the deputies number one to every 50,000 inhabitants.

Deputy, a lieutenant or substitute who exercises power which properly belongs to another who has placed him in his stead. The appointment of a deputy does not free the principal from responsibility. A deputy must take an oath of office. His salary is paid by the government. If authorized for the time being to act with full power of his principal, he is called a general deputy, and may act in his own name. Otherwise when acting in a particular and limited matter he is only a special deputy.

De Puy, de pū, **Henry Walter,** American miscellaneous writer: b. Pompey Hill, Onondaga County, N. Y., 1820; d. 2 Feb. 1876. He constantly contributed political articles to the press; wrote several popular poems, and was the author of 'Kossuth and his Generals,' with a brief history of Hungary (1851); 'Louis Napoleon and his Times,' with a memoir of the Bonaparte family (1853); 'Three Score Years and Beyond' (1873); etc.

De Puy, William Harrison, American Methodist clergyman: b. Penn Yan, N. Y., 31 Oct. 1821; d. Canaan, Conn., 4 Sept. 1901. He was the editor of the Methodist Year Book 1866–89, and was associate editor of the New York 'Christian Advocate' for 25 years. He published: 'Compendium of Useful Information' (1878); 'The People's Cyclopedia of Useful Knowledge' (1879); 'Home and Health and Home Economics' (1880); 'The People's Atlas' (1882); 'University of Literature' (1896).

De Quincey, Thomas, English essayist: b. Greenhay, near Manchester, 15 Aug. 1785; d. Edinburgh 8 Dec. 1859. He was a boy of remarkably quick and precocious abilities, and acquired such great proficiency in classical studies that the master of the school which he attended pointed him out on one occasion to a stranger with the remark, "That boy could harangue an Athenian mob better than you or I could address an English one." His father died in 1793 and young De Quincey was extremely urgent with his guardian to send him to the University of Oxford; and his importunities proving unsuccessful, he ran away from the Manchester grammar-school with 10 guineas and a volume of Euripides in his pocket. He directed his steps first to North Wales, and afterward wandered up to London, where he arrived in May 1800, in an absolutely destitute condition, with his store of money exhausted, and not a friend to whom he could apply. For 10 weeks he roamed through the streets of the metropolis, unprovided with food or shelter, except such as was furnished him by charitable persons. He was at last discovered by his family and sent to Worcester College, Oxford, where he remained till 1808. Having been afflicted with rheumatism in the autumn of 1804, he was induced to alleviate the pain by doses of opium, and a foundation was thus laid of a pernicious habit, which in his case, as in that of Coleridge, proved extremely deleterious both to physical and mental health. For the first 10 years, however, of his addiction to the practice, the evil results were not perceptible, and in the possession of a sufficient fortune, a genial circle of friends, and freedom from bodily ailments, he spent the life of a learned and speculative voluptuary. In 1804 he had first become acquainted with Charles Lamb, and in 1807 with Coleridge. In 1809 he took a lease of the cottage of Grasmere, Westmoreland; previously occupied by Wordsworth, and there, in that beautiful locality, in the

neighborhood of Wordsworth, Southey, and other literary friends, he continued to reside for upward of 20 years. In 1813 a severe derangement of his stomach forced him to increase his doses of opium, which he now took regularly every day. In 1816 he married; and in 1821, making a strong effort to shake off his habitual indolence, he commenced his 'Confessions of an English Opium Eater,' which appeared in the London 'Magazine' for that year, and were published in a collected form in 1822. In 1843 he took up his abode at Lasswade, Mid-Lothian, and here he remained almost to the end of his life. The latest, most complete, and best edition of his works is that published 1889–90, under the editorship of Prof. David Masson, in 14 volumes. See Japp (H. A. Page) 'Life of De Quincey' (1890); Findley, 'Personal Recollections of De Quincey' (1885); Stephen, 'Hours in a Library.'

Dera, dĕr'a (a word derived from the Arabic "der," a monastery), the name of several towns in British India, the two principal places so designated being Dera Ghazi Khan, capital city of a district of the same name in the province of Punjab, about four miles west from the Indus River, in lat. 30° 4′ N., and lon. 70° 50′ E. It is a British military station, is situated on the Sindhsagar Railroad, and contains many stately religious buildings and mosques. Pop. 23,899; and Dera Ismail Khan, capital city of the government district of Deradschat, in the Punjab, about eight miles west from the Indus, in lat. 31° 50′ N. and lon. 70° 59′ E. It comprises an English and Indian city, in the former of which is a British garrison, two regiments of infantry, one of cavalry, and one battery of artillery. The Indian city is surrounded by a mud wall, and occupied by noble native families. It is a trade depot for Afghanistan. Pop. 21,573.

Dera Ghazi Khan, dĕr'a gä-zē' kän, India, a district and a town in the Punjab, in the division of Derajat. The district lies entirely on the right bank of the Indus, and consists of a sandy strip of low land shut in between the Suleiman Hills and the river. The town lies about two miles from the Indus, has many striking mosques, town-hall, court-house, handsome bazaar, cantonments, etc. Pop. of the town 27,886.

Dera Ismail Khan, ēs-mä-ēl' kän, India, a district and a town in the Punjab, in the division of Derajat. The district lies north of that of Dera Ghazi Khan on both sides of the Indus, and is in great part barren and sandy. The town is situated four and one half miles west of the Indus, and is the administrative headquarters of the Derajat division as well as of the Dera Ismail Khan district. There are here various government offices, cantonments for troops, and an important station of the Church Missionary Society. It is a somewhat straggling town on a level plain. Pop. 26,884.

Derajat, dĕr-a-jät, a division or commissionership of India, forming a portion of the Punjab, and occupying part of the valley of the Indus. It comprises the districts of Dera Ghazi Khan, Dera Ismail Khan, Muzaffargarh, and Bannu. Much of it is sandy and uncultivated, but many parts are well cultivated, and irrigation is largely employed. The area under cultivation is increasing rapidly. Area 22,315 square miles. Pop. 1,643,603.

Derbend, dĕr-bĕnd, or **Derbent** ("gateway"), Russia, a port and capital of the district of Daghestan, on the western shore of the Caspian, 140 miles northwest of Baku. It is charmingly situated among vineyards and orchards and fields of maize and madder, on the declivity of a branch of the Caucasus, which here approaches very close to the water's edge. It is surrounded by ancient walls. The harbor is inaccessible to all but small vessels; but a considerable trade is done at the four large markets held here yearly. Silk and cotton fabrics, earthenware, and weapons are manufactured, and saffron is cultivated. It was long considered the key of Persia on the northwest side. It was captured by the Arabs in 728, by the Mongols in 1220, and frequently changed hands before it was formally incorporated with Russian Caucasia in 1813.

Derby, Earl of, a title conferred in 1485 on Thomas, second Lord Stanley, two months after Bosworth Field, where he and his family had greatly contributed to Richmond's victory. The Stanleys were descended from Adam de Aldithley, who attended William the Conqueror to England, and whose grandson, having married the heiress of Thomas Stanley, of Stafford, exchanged the Manor of Thalk in that county, which he had received as his wife's marriage-portion, for that of Stoneley, in the county of Derby, and afterward assumed the surname of Stanley. In 1405 Sir John Stanley, who had married the heiress of Lathom, obtained a grant of the Isle of Man, which he and his descendants ruled till 1733.

Derby, Edward Geoffrey Smith Stanley, 14TH EARL OF, English statesman: b. Knowsley Park, Lancashire, 29 March 1799; d. there 23 Oct. 1869. In 1820 he was returned to the House of Commons as member for Stockbridge, in Hampshire. His very first speech marked him out as a skilled debater, and he rapidly rose to distinction in the House. His views at first inclined him to side with the Whig party. In 1827 he joined Canning's ministry as under secretary for the colonies; and became chief secretary for Ireland and Lord Grey. The opposition, led by O'Connell in the House of Commons, was powerful and violent; but while he firmly resisted the extravagant demands of the opposition, and the agitation for the repeal of the union, he succeeded in passing a number of measures which tended to lessen the prevailing discontent. He improved the administration of justice, carried a bill establishing a system of national education, and afterward, as secretary of state for the colonies supported the bill for the reform of the Irish Church, by which two archbishoprics and 10 bishoprics were abolished. He also gave his warm support to the petitions which were presented to Parliament for the abolition of slavery in the British colonies, and was successful in passing the act for this purpose in 1833. He now joined the Tories; and accepted office under Sir Robert Peel, being again appointed colonial secretary. He distinguished himself by his wise administration of this department during the four following years. In 1851 and 1858 he was commanded by the queen to form a ministry, but on both occasions he had to contend against a majority

in the House of Commons, and was able to maintain himself in office only for a short period. He was more successful in 1860, when, on the defeat of Lord John Russell's government on one of the chief clauses of their reform bill, he undertook to form a ministry. His administration on this occasion was signalized by the reform of the government in India, the successful conduct of the Abyssinian war, and the passing of the reform bill which introduced household suffrage as the qualification for the electoral franchise. Earl Derby joined to great ability as a statesman, and brilliant oratorical powers, a high degree of scholarly culture and literary ability. Among other works he published a successful translation of Homer's Iliad (1864). See Kebbel, 'English Statesmen Since the Peace of 1815: Derby' (1869); Saintsbury in Reid's 'Prime Ministers of Queen Victoria' (1892).

Derby, Edward Henry Smith Stanley, 15TH EARL OF: b. Knowsley, Lancashire, 21 July 1826; d. there 21 April 1893. He was educated at Rugby, and Trinity College, Cambridge. In 1852 he was under secretary of foreign affairs; afterward secretary of state for India. Under his superintendence the management of the British India empire was transferred from the East India Company to the government of Great Britain. In 1866 and also in 1874 he was secretary of state for foreign affairs. Lord Derby became a Liberal in 1879, and was secretary of state for the colonies under Mr. Gladstone from 1882 to 1885. He, however, took a stand against Irish Home Rule in 1886 and afterward ranked among Mr. Gladstone's opponents.

Derby, George Horatio, pen name "JOHN PHŒNIX," American humorist: b. Dedham, Mass., 3 April 1823; d. New York 15 May 1861. He was graduated at West Point (1846), and served in the army during the Mexican war (1846–7). He wrote under the name "John Phœnix" a series of sketches and burlesques, entitled 'Phœnixiana' (1855); and 'The Squibob Papers' (1859).

Derby, Orville Adelbert, American geologist: b. Kelloggsville, N. Y., 23 July 1851. He graduated from Cornell University in 1870, made trips to Brazil in 1870 and 1871; and was instructor at Cornell in 1873–5. In 1875 he became a member of the Brazilian geological commission, and has since been engaged in geological work in Brazil, being at one time curator of the geological department of the National Museum, and holding the position of chief of the geographical and geological survey of São Paulo since 1886. He has published a number of valuable papers on the geology and geography of Brazil, and is considered one of the first authorities on the subject.

Derby, Conn., city in New Haven County, at the junction of the Naugatuck and Housatonic rivers, and on the New York, New Haven & Hartford Railroad; nine miles west of New Haven. In 1893 the towns of Birmingham and Derby were consolidated and incorporated as the city of Derby. It is a manufacturing city of much importance and has abundant water power from the two rivers. There are extensive manufactures of brass and iron goods, paper, pins, and spectacles, and at one time the old town had a large West India trade and noted ship-building yards. A bridge across the Naugatuck River connects Derby with the thrifty manufacturing city of Ansonia. It has several parks, daily and weekly newspapers, a national bank, good public and private schools. Pop. 7,930.

Derby, England, a municipal and parliamentary borough, capital of Derbyshire, on the Derwent River, and the main line of the Midland Railroad, 115 miles north-northwest of London. It has some fine public buildings, among which are the churches of All Saints, St. Alkmund, and St. Werburgh, built before the time of Henry VIII.; St. Mary's (Roman Catholic) designed by Pugin. The Derby public school dates from the time of Queen Mary. There is also a very handsome free library and museum. The principal manufactures are silk, cotton, paper, articles in Derbyshire spar, castings, and porcelain, etc. Derby is one of the oldest towns in the kingdom, and is supposed to owe its origin to a Roman station, Derventio, situated at Little Chester, on the opposite side of the river. Under the Danes it took the name of Deoraby. Richardson, the novelist, was a native of the town. Pop. (1901) 105,785.

Derby Day, the great annual London holiday, on which "The Derby," one of the most popular of the English horse-races, is run. It always falls on a Wednesday, being the second day of the grand race meeting, which takes place in the week after Trinity Sunday. The race is run on Epsom Downs, an extensive plain in the neighborhood of London. This race was instituted by the Earl of Derby in 1780. The entry-money is now $500, but under the new regulations introduced in 1890 the first prize is definitely fixed at $25,000 with any surplus fees. The course over which the race is run is a mile and a half in length. Since the race was instituted the weights have been several times increased, until now the colts have to carry nine stone, and the fillies eight stone nine pounds. Derby day is now regarded, especially in London, as a great holiday, and vast multitudes flock from the city and its neighborhood to Epsom Downs. The grand inauguration racing day of the summer season at Washington Park track, Chicago, is now called the American Derby day.

Derbyshire, a county in England, in the interior; area 1,029 square miles. The county is noted more for its coal mining and manufacturing than for agriculture. Its beautiful scenery and the numerous mineral springs attract tourists and health seekers. Its chief minerals are coal, iron ore, lead, fluor or Derbyshire spar, sandstone, limestone, alabaster, marble, zinc, and elastic bitumen. Some of the industries of the county are the manufacture of iron, silk and cotton goods, calico prints, agricultural implements, paper, hats, porcelain, various kinds of cloth, and vases, urns, etc., from the Derbyshire spar. The coal mining is an important industry and to transport the coal several canals and railroads cross the county. The principal towns are Derby, Buxton, and Belper. Pop. 620,196.

Derbyshire Spar, also called fluorite, and fluor-spar; is abundant in Derbyshire, and also in Cornwall, England. In the north of England it is the gangue of the lead veins which intersect the coal formations in Northumber-

land, Cumberland, Durham, and Yorkshire. It is found of almost every variety of color. The "Blue John" of the Derbyshire miners is a crystalline fluorite in which are alternate bands of blue and pale yellow spar. It is made into ornamental articles such as vases. See FLUORITE.

Derceto, dĕr-sē'tō, the Greek name of a Syrian goddess, the principal female deity of the Philistines, widely worshipped at Ascalon. She was the female counterpart of Dagon (q.v.), terminating like him in a fish. She was a nature goddess presiding over the principle of generation and fertility.

Derecske, dĕ'rĕch-kĕ, Austria-Hungary, a market town in Hungary, in the county of Bihar. In the neighborhood are four lakes, from which, by evaporation, soda is obtained. Nearby is another lake, called Fingoto, celebrated from the earliest times for its baths. In the same locality pearls are found, which, though small, are equal in beauty to those of the East. Pop. 8,272.

Derelict, any property abandoned at sea. Especially a ship abandoned by her crew either by consent or by compulsion, stress of weather, or other unforeseen condition, and yet, to save the owner's rights, if any cat, dog, or other domestic animal be found on board alive, it is not forfeited. The owner may yet recover, on payment of salvage, within a year and a day — otherwise the whole may be taken.

De Reszke. See RESZKE.

Derg, Lough, lŏH dĕrg. (1) An expansion of the Shannon River, between the provinces of Munster and Connaught, Ireland. (2) A lake in the southeast of the county of Donegal, province of Ulster, Ireland. Saint's Isle and Station Island are in this lake.

Derham, dĕr'am, William, English philosopher and divine: b. Stoughton, near Worcester, 26 Nov. 1657; d. Upminster, Essex, 5 April 1735. He became in 1685 vicar of Wargrave, in Berkshire, and in 1689 rector of Upminster in Essex, where he spent the remainder of his life. Though small in stature, distorted, and of ungainly appearance, he had a highly gifted mind, and not only possessed the universal esteem of his parishioners, but acquired considerable reputation in various departments of literature. His best known works are: 'Physico-Theology'; 'Astro-Theology'; and 'Christo-Theology.'

Dermati'tis, a name given to certain inflammations of the skin, characterized not so much according to form and arrangement of the pathological changes taking place in the skin, but rather from their cause. These causes may act from within or without. The characteristic change taking place is some form of erythema or redness, with the characteristic heat, redness, and swelling. Thus there are found dermatitis traumatica, or the dermatitis set up by mechanical injuries such as blows, pressure, friction, scratching; dermatitis calorica, such as is due to sunburn or frostbite; X-ray dermatitis, dermatitis venenata, due to animal, vegetable, or mineral poisons, such as mustard, turpentine, croton-oil, tartar emetic, poison ivy, nettle, aniline dyes, strong acids, strong alkalies, arnica, etc.; dermatitis medicamentosa, or drug eruptions, such as happen following the use of antifebrin, antipyrin, belladonna, arsenic, bromides, iodides, etc. There may be also dermatitis following vaccination or following poisoning in wounds. There are other forms too numerous to mention, but those given are the commonest.

Dermatol'ogy, (from Gr. *derma*, the skin), a science that treats of skin diseases. See SKIN.

Dermat'ophyte, a parasitic plant, a sort of fungus infesting the cuticle and epidermis of men and animals, and giving rise to various forms of skin disease. The commonly known species are *Achorion Schœnleinii* (favus); *Trichophyton tonsurans* (ringworm); and *Microsporon furfur* (dandruff, scurf).

Dermestes, dĕr-mĕs'tēz, a genus of coleopterous insects, the type of the family *Dermestidæ*. The larvæ of this genus are covered with slippery hairs. They devour dead bodies, skins, leather, and other animal substances. One species (*D. lardarius*) is known by the name of bacon-beetle, and is often found in ill-kept ham or pork shops. Many insects, the larvæ of which have similar habits to those of the true *Dermestes*, sometimes receive that name, although they really belong to the genera *Attagenus*, *Necrophorus*, etc.

Der'mot Mac Mur'ragh, Irish king: the last ruler of Leinster, before the sovereignty was assumed by Strongbow, in the reign of Henry II. of England. He became king of Leinster in 1140, and having carried off the wife of O'Ruarc, Prince of Leitrim, was attacked by the latter, and was driven from Ireland in 1167. He betook himself to Aquitaine, where he did homage to the English king, who granted him permission to enlist adventurers in England, to aid him in recovering his kingdom. He received the aid of Richard de Clare, Earl of Pembroke, usually called Strongbow, who married his daughter Eva in 1170. With his aid he proved victorious, but when he died in the same year his kingdom was assumed by his son-in-law.

Dernburg, Friedrich, frēd'rĭH dĕrn'boorg, German journalist and descriptive writer: b. Mentz 3 Oct. 1833. After a university course he rapidly acquired eminence in journalism and politics, and was a well-known correspondent at the Chicago Columbian Exposition. 'From the White City' (1893), a series of World's Fair sketches; 'In the Bonds of Guilt' (1894); and 'The Over Proud' (1889), are typical specimens of his fact and fiction.

Derne, dĕrn, or **Derna,** Africa, a town of Tripoli, in Barca, on the north coast of Africa, in a fertile district. It was captured by the United States fleet in 1815 during the war against Tripoli. Pop. 6,000. See DERNE EXPEDITION.

Derne Expedition (Derna or Dern), an expedition undertaken during the first years of the 19th century by William Eaton, an American who had been United States consul to Tunis in 1799–1803. Eaton became indignant at the abject submission of Christendom, part from fear and part from greed, to the wretched Barbary pirates; he had raged at their insults year after year while he was consul at Tunis; and when Tripoli, in 1801, finally insisted on war despite all payments, eagerly seized the chance of ending its robberies once for all by making it a United States protectorate. About 1792

Hamet Caramanli or Caramelli, pasha of Tripoli, had been deposed by his brother Yusuf and fled to Tunis, where he was then living; and Eaton resolved to have the United States restore him on condition of peace and no tribute, and thus striking terror into the other piratical states. He borrowed $22,000 for Hamet to equip a force, with which our navy was to co-operate; but the naval commanders' hands were tied by their instructions, and in 1803 Eaton's plain-spoken refusal to comply with the bey's extortions caused his peremptory dismissal as consul. He returned to the United States and urged Jefferson to make the country a United States protectorate, but the government could not give *carte blanche* for so daring a scheme to the fiery dreamer. At length, in March 1804, Eaton was sent to the Mediterranean as "naval agent" with Barron's squadron, but without authority or instructions. He cared for neither squadron nor authority if he could have help and be let alone. Meantime Hamet Caramanli had failed and fled to Egypt, where, when Eaton arrived at Cairo on 8 December (having heard at Malta, in September, of Hamet's fiasco), the viceroy was besieging him and a few followers at Minyeh on the Nile. Eaton rescued him at great pains and some peril, and brought him to Alexandria; made a pact with him and a plan of campaign with Barron; and collected an "army" of some 500 floaters,—the majority Arabs, some Tripolitan Kabyles, a hundred Alexandrian Christian Greeks and Americans, a most extraordinary rabble for a desperate military venture,—and started for a march of 600 miles across the Libyan Desert to Derne, the seaport capital of Barca, the most fertile province of Tripoli. They had no provisions but what they carried, and no water for days together; and more than once the Arabs with Hamet were on the point of deserting in a body or cutting Eaton's throat. His energy and moral force finally pulled the entire body through a six weeks' march to Bomba, just east of Derne, 17 April 1805; but no ships were in sight. The Arabs cursed him afresh as an infidel traitor, and resolved to break up next morning; Eaton and the Christians took post on a hill for the night and lit fires, and next morning the waiting fleet saw the smoke and came in. The Arabs rejoined them, and after restocking from the fleet, and resting a week, on the 25th, in co-operation with three cruisers, they assailed Derne, defended by earthworks and 800 men. On the 27th they carried it by storm, Eaton being shot through the wrist. A large force was sent from Tripoli to retake it; and on 13 May he repulsed it in a sharp engagement with the aid of the fleet's guns. Another month passed; Derne showed no enthusiasm over Hamet, one Oriental master being about the same as another; Eaton could not march on Tripoli, some 700 miles farther on, but the pasha's troops could not drive him from Derne. Suddenly the ground was cut from under his feet by Lear's astounding treaty with the pasha, defensible as a treaty, but in its terms most incomprehensible and indecent. Hamet's supporters were left to the pasha's vengeance, Hamet to European exile and a grudging pension, and Hamet's family in the possession of the pasha. As to Eaton, he was left to useless political agitation, idle energies, and drink. See Barbary Powers, United States Treaties and Wars with the.

Derosne, Charles, shärl dė-rōn, French chemist and inventor: b. Paris 1780; d. there September 1840. He devised a still for the rectification of alcohol so arranged that instead of the weaker aqueous spirit which distilled being completely condensed by cold water, it was condensed by water only a little under the boiling-point of the mixture, so that while the alcohol still remained as vapor, a large proportion of the watery vapor was condensed, and thus the distillate was made stronger. This apparatus is called by his name. His most important research was into the composition of opium, in the course of which he isolated a crystalline body, long distinguished as Derosne's salt. He himself did not determine its character, and it was not till some years later that it was distinguished as an alkaloid by Robiquet, and called by him narcotin, the name by which it is now known. He was the first to introduce animal charcoal for decolorizing syrup.

De Rosny, Léon, lā-ôṅ dė rō-nė, French Orientalist: b. Loos, France, 5 Aug. 1837. He became professor of Japanese at the Special School of Languages in 1868, and founder of the International Congress of Orientalists. Among his numerous works are: 'Asiatic Studies' (1864); 'The Origin of Language' (1869); 'Japanese Anthology' (1871); 'A Grammar of the Chinese Language' (London 1874); 'Japanese Religion' (1881); and various translations, pamphlets, and essays.

Déroulède, Paul, pol dā-roo-lād, French poet: b. Paris 2 Sept. 1846. His 'Soldier Songs' (1872) and 'Military Refrains' (1888) were immensely popular, and won him the presidency of the Patriotic League; an association intensely hostile to Germans, and whose agitation seemed likely to lead to a collision with Germany, wherefore the poet was prevailed on to retire from the presidency. He has written a drama on patriotism, 'The Hetman,' and the semi-religious drama, 'The Moabitess.'

Derrick. See Hoisting Apparatus.

De Russy, René Edward, American military officer: b. in Haiti, W. I., 22 Feb. 1789; d. San Francisco 23 Nov. 1865. He was graduated at the United States Military Academy in 1812, serving with credit in the war with England. He subsequently supervised the construction of fortifications in New York harbor and the Gulf of Mexico. During the Civil War he was ordered to the Pacific coast, where he constructed defenses in San Francisco harbor.

Dervish, or Dervis (Per. "poor"), the name of a class of religious devotees of the Mohammedan faith, all leading a life of poverty, and generally practising mendicancy. The observance of strict forms, fasting, and acts of piety, give them a character of sanctity among the people. They live partly in monasteries, partly alone, and from their number the imams are generally chosen. Throughout Turkey they are freely received, even at the tables of persons of the highest rank. There are, throughout Asia, multitudes of these devotees, monastic and ascetic, not only among the Mohammedans, but also among the followers of Brahma. There are 32 religious orders now existing in the Turkish empire, many of which are scarcely known beyond its limits; but others, such as the Nakshbendies and Mevlevies, are common in

Persia and India. All these communities are properly stationary, though some of them send out a portion of their members to collect alms. The regularly itinerant dervishes in Turkey are all foreigners or outcasts, expelled from their orders for misconduct. All these orders, except the Nakshbendies, are considered as living in seclusion from the world; but that order is entirely composed of persons who, without quitting the world, bind themselves to a strict observance of certain forms of devotion, and meet once a week to perform them together. Each order has its peculiar statutes, exercises, and habits.

The numerous orders of dervishes are all divided into two great classes, the dancing and the howling dervishes. The former are the Mevlevies, and are held in much higher estimation than the other class. They are the wealthiest of all the religious bodies of the Turkish empire. The dancing of these dervishes is conducted to sounds of music. The movement at first is slow, but as the dervishes become excited it grows in animation, until at last the actors are exhausted, and are obliged to sit down. After a while they rise up again and resume their dancing, which is repeated several times. The whole is concluded by a sermon. The howling dervishes accompany their dancing with loud vociferations of the name of Allah, and violent contortions of the body such as are seen in persons seized with epileptic fits. In former times these dervishes, after working themselves up into a frenzy, used to cut and torture themselves in various ways with apparent delight. The sheiks of all orders have the credit of possessing miraculous powers. The interpretation of dreams, the cure of diseases, and the removal of barrenness, are the gifts for which the dervishes are most in repute. See FAKIR.

Derwent, dĕr'wĕnt, (1) the name of four rivers in England, in Derbyshire, Yorkshire, Durham, and Cumberland respectively. The Yorkshire Derwent is a tributary of the Ouse. (2) A river in Tasmania. It expands into an estuary where it enters the South Pacific Ocean. A lighthouse, elevated 70 feet above the sea, has been erected on Iron Pot Island, at the entrance of the Derwent, exhibiting a fixed light, visible at from 12 to 15 miles' distance. On the Derwent estuary is the town of Hobart.

Der'wentwater, James Ratcliffe, EARL OF, English nobleman: b. London 28 June 1689; d. London 24 Feb. 1716. His grandfather had been created Earl of Derwentwater by James II., and his father, Francis, married a natural daughter of Charles II. He succeeded to the title in 1705 and entertained a personal attachment toward the Stuart family, which induced him to take part in the attempt to restore them to the English throne. The standard of revolt having been raised in Scotland, Lord Derwentwater commenced the movement in England on 6 Oct. 1715. The cause of the Pretender was a losing one from the first, and in spite of the energy and courage displayed by the Earl of Derwentwater and other Jacobite nobles, they were compelled to surrender at discretion at Preston on 13 Nov. 1715. The Earl of Derwentwater, being impeached for high treason, pleaded guilty, and was beheaded on Tower Hill. His estates were confiscated and given to Greenwich Hospital.

Derwentwater, or Keswick Lake, a beautiful lake in Cumberland, England, in the vale of Keswick. It is about three miles in length and one and a half in breadth, and stretches from Skiddaw on the north to the hills of Borrowdale. Near the northeast corner is the celebrated cascade of Lodore. Its waters are carried to the sea by the Derwent.

Derzhavin, dyĕr-zhä'vēn, **Gab'riel Roma'novitch,** Russian lyric poet: b. Kasan 14 July 1743; d. Novgorod 6 July 1816. In 1793 he was called to the senate, in 1800 was master of the imperial treasury, and in 1802 was minister of justice. The year following he was permitted to retire on full pay. His poetic talent had become early developed, and he is generally allowed to hold the first place among the poets who appeared during the reign of Catharine. He was an enthusiastic admirer of this empress, and has celebrated her in his most brilliant odes. Of these, however, at once the most beautiful and the best-known is his 'Oda Bog,' or 'Address to the Deity,' which, for sublimity both of thought and expression, has seldom been surpassed, and has been translated into most European languages. Almost all his poems are rich in true poetic beauties, though occasionally he indulges too much in gaudy Oriental metaphor. His works, containing, in addition to the Odes, several dramatic pieces and prose writings, were published at St. Petersburg 1810–15.

Desaguadero, dā-sä-gwä-thā'rō, a valley in Bolivia and Peru, between two ridges of the Andes into which the great chain divides, near the city of Potosi. This valley or table-land is about 400 miles in length, and varies from 30 to 80 miles in breadth; area 150,000 square miles, and includes Lake Titicaca, and the smaller lake Aullagas or Uros. Desaguadero signifies in Spanish "a channel."

Desaguadero River, Bolivia, (1) the outlet for the waters of Lake Titicaca. It is 280 miles in length, running from Lake Titicaca southward to Lake Poopó or Agullas, in the department of Oruro. The lake last mentioned is without any known outlet. For many years traffic on this river has been hampered, the Lake Titicaca steamers running only as far as the town of Desaguadero (the head of navigation, pending improvements, for boats of considerable size), while beyond that town smaller steamers, engaged in carrying the silver and tin ores of Oruro and the copper of Corocoro, descended to a point 40 miles farther down the stream. A concession for canalizing the Desaguadero so as to extend navigation about 200 miles farther south was granted by the Bolivian government to a Peruvian corporation in 1892. Moreover a railroad from the northern shore of Lake Titicaca to Cuzco was projected, and has been partly built. These works, when completed, will form a system of land and water transportation unique in all the world; approximately 500 miles in length, and at an altitude ranging between 11,000 and 13,000 feet above the level of the sea, connecting the historic Cuzco (the ancient Inca capital) and the extensive silver and lead districts of Totalaya on the north, with the mines of Corocoro and Oruro. (2) A river called Desaguadero is in Argentina, and flows into Lake Bevedero Grande and separates the provinces of San Juan and Mendoza.

Desaix de Veygoux, Louis Charles Antoine, loo ē sharl an twan de-sā de vā-goo, French general: b. St Hilaire-d'Ayat, Auvergne, 17 Aug. 1768; d. Marengo 14 June 1800. Entering the army at 15, in 1790 he covered himself with glory by his heroic conduct in Moreau's famous retreat through the Black Forest. Behind the ruinous fortress of Kehl, Desaix resisted the Austrian army for more than two months, only capitulating in January 1797, when his ammunition was spent. He served with Bonaparte in Egypt, where he distinguished himself greatly, and was appointed governor of the upper part of the country. He completely subdued Upper Egypt, and received, as a testimony of admiration from Bonaparte, a sword, with this inscription on its blade, "Conquete de la Haute Egypte." His own soldiers used to compare him to Bayard, while the inhabitants named him "the Just Sultan." He was obliged, however, in 1800, to sign the unfavorable treaty of El Arish with the Turks and English, and on his way to France was captured and detained by Lord Keith as a prisoner of war. He afterward obtained his parole, and returned from Egypt just in time to take part in the battle of Marengo, in which he was killed.

Desâtir, the name given to a collection of sacred books, purporting to be the work of the 15 old Persian prophets, together with a book of Zoroaster. The collection is written in a language no longer spoken and equally different from the Zend, the Pehlvi, and modern Persian. The last of the 15 prophets, Sasan, who lived at the time of the downfall of the Sassanides, literally translated the Desâtir, and accompanied it with commentaries. This work was until the 17th century one of the chief sources of the ancient Persian religious doctrines, interwoven with astrology and demonology; and, after having been forgotten for about a century and a half, was discovered at Ispahan and published at Bombay in 1818. Erskine added an English translation, but considered the collection as spurious; and Sylvester de Sacy believed it the work of a Parsee in the 4th century of the Hegira, who invented the language. By some, however, it is considered as genuine. No trace of any connection with the Zendavesta and the magic of the Parsees has been found in the Desâtir.

Désaugiers, Marc Antoine Madeleine, mārk äñ-twañ mad-lēn dā-zo-zhē-ā, French song writer and dramatist: b. Fréjus 17 Nov. 1772; d. Paris 9 Aug. 1827. His life till 1797 was full of adventure; he was at one time a prisoner of the revolted blacks in San Domingo and in momentary fear of death. Going on the stage in Paris in 1805, his parody of the opera 'Danaids' ("The Little Danaids") was acted for 300 consecutive nights. His vaudevilles were remarkably successful. As a light song writer he is second only, if indeed second, to Béranger. Many of his songs will live long; such as 'The Consolations of Old Age,' 'The Picture of New Year's,' 'The Market,' 'Sunday Pleasures,' 'The Palais Royal.'

Desault, Pierre Joseph, pē-ār zhō-zĕf dē-zō, French surgeon: b. Magny-Vernais 6 Feb. 1744; d. Paris 1 June 1795. He was designed for the church, early studied mathematics and philosophy, and was led by his inclination to the surgical profession; in consequence of which he entered the military hospital at Béfort, where his diligence and talent for observation supplied the defects of a suitable instruction, and his situation was favorable for obtaining a knowledge of the treatment of wounds from fire-arms, in which department he afterwards rose to great eminence. He went to Paris in 1764, and was one of the numerous scholars of the celebrated Petit. Two years afterwards he became a lecturer, and though his delivery was bad, he soon became celebrated by introducing a new method of teaching anatomy. While lecturing on the parts of the human body, he treated of the diseases incident to each. After having been several years principal surgeon of the hospital De la Charité, where he increased his reputation by introducing new methods of treatment, or by improving and simplifying those already in use, he was put at the head of the great Hôtel-Dieu in Paris, in 1788. Here he founded a surgical school, in which have been educated many of the most eminent surgeons of Europe. His principal merits were, that he brought accuracy and method into the study of surgery; improved the treatment of fractured bones, by adopting improved bandages; first introduced into France the clinical method of instruction in surgery; and infused into his scholars a generous attachment to their profession. He was distinguished for the skill and boldness with which he performed operations. This happy natural talent, this surgical instinct that guided them in the most difficult cases, compensated his want of professional learning, to which he was so indifferent that in his later years he read very little; and as he was entirely ignorant of internal diseases he was indignant when, at the foundation of the École de Santé, in which he became professor of clinical surgery, the study of medicine and surgery were connected. He died while attending upon the son of Louis XVI., in the Temple. Desault wrote only two small treatises; but the Journal de Chirurgie, in which his scholars published his lectures delivered in the Hôtel-Dieu, and the Œuvres Chirurgicales, edited by Bichat under Desault's name, contain his whole system.

Desbarres, dā-bär', Joseph Frederick Wallet, English military engineer: b. England 1722; d. Halifax, N. S., 24 Oct. 1824. In 1756 he sailed as lieutenant for America, where he raised, and for a time commanded, a corps of field artillery. In 1757 he gained a victory over the Indians who had captured Fort Schenectady; and at the siege of Quebec was aide-de-camp to Wolfe, who was mortally wounded while Desbarres was making a report. He conducted the subsequent engineering operations during the conquest of Canada, and was quartermaster-general in the expedition that retook Newfoundland (1762). He made a survey of the coast of Nova Scotia in 1763–73, and afterward prepared charts of the North American coast for Lord Howe. He was lieutenant-governor of Cape Breton (1784–1804), and of Prince Edward Island (1805–13).

Descartes, René, rē nā dā-kärt, French philosopher: b. La Haye in Touraine 31 March 1596; d. Stockholm 11 Feb. 1650. He was educated at the Jesuit College of La Flèche. Here he studied physics and philosophy according to the scholastic system and showed especial fondness and aptitude for mathematics, which alone

seemed to satisfy his demand for certain and clear knowledge. All else that he had learned seemed to him lacking in the clearness and certainty that would entitle it to be ranked as knowledge. After leaving school he went to Paris where he continued his studies. He then enlisted in the military service of the Netherlands and afterward in that of Bavaria. During these years he was always tormented by doubts, and was constantly seeking a method by which he could attain certainty. At length he made the discovery of his famous principle of certainty which he expressed in the proposition, "I think, therefore, I am" (*cogito ergo sum*), and which he regarded as "the foundations of a wonderful science." In 1629 he withdrew into seclusion in Holland, frequently changing his residence that he might continue his work without interruption. Here he lived for 20 years and produced the works upon which his fame rests. In 1649 he accepted the invitation of Queen Christina of Sweden to come to Stockholm and personally instruct her in his philosophy. The queen preferred to have her lectures in philosophy at 5 o'clock in the morning and Descartes had to proceed to the palace at that hour. The severity of the climate and the life at court were injurious to his naturally weak constitution, and a year after his arrival he contracted an illness from which he died.

For Descartes' philosophy see the article CARTESIANISM. His fame rests not merely upon his contributions to philosophy, however, but also upon his services to physical science and mathematics. He discarded the old methods of explaining physical phenomena by means of final causes, and insisted that everything takes place mechanically. He is one of the chief pioneers of the mechanical view of the world, and formulates clearly the fundamental laws of this mode of explanation, which he extends to explain all physiological processes. In mathematics he made important contributions to the theory of equations and was the originator of the science of analytical geometry.

Descartes' principal works are: 'The Discourse on Method,' which gives a clear account of development of his thought and with which was published his 'Dioptrics,' 'Meteors,' and 'Geometry,' under the common title of 'Essais philosophiques' (1637); 'Meditations on the First Philosophy' (1641); 'The Principles of Philosophy' (1644); 'The Treatise on the Passions' (1650). The French Academy are at present publishing a monumental edition of Descartes' works, several volumes of which have already appeared. The most important writings have appeared in the English translations of Veitch and Torrey. Consult Millet, 'Descartes, Sa vie, ses travaux, et ses decauvertes' (2 vols. 1871). See CARTESIANISM.

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Descartes' Rule of Signs is a theorem by which the maximum number of positive or negative roots of an equation can at once be detected on sight. The theorem may be thus explicated: The number of positive roots of an equation cannot exceed the number of variations in the signs of its coefficients, considered in their proper order. A fair example is the cubic equation: $F(x)=3x^3-7x^2+11x+4=0$. Here are but two variations of signs on passing from one extreme term to the other, through the intermediate ones; we conclude therefore that the cubic can not have more than two positive roots. The maximum number of negative roots is seen on applying the same theorem to the equation which is obtained from the original by changing x into $-x$. Thus the positive roots of $F(-x) = 3x^3+7x^2-11x+4=0$ are negative roots of the original cubic, and by Descartes' rule cannot exceed three.

Descendants, as a term of law, is applied to the issue of a person, or the offspring of such issue, to the farthest generation. Such descendants have a prior claim over collateral relatives or ascendants in the inheritance of property left by a deceased ancestor.

Descent in Law is the transmission of the real estate of a person dying intestate to his heir or heirs. The title acquired by the heir, in this manner, is called title by descent.

Prior to the Revolution, the law in England was that real estate could only descend and never ascend; but in the United States the law has been changed by statute, and at the present time real estate may ascend as well as descend; but, as far as the title is concerned, it is called title by descent.

According to the old English law, real estate descended to the oldest son who was living; provided that he had no elder brother who had died leaving a son to survive him; if all the sons had died without leaving issue, all of the daughters inherited together. There were exceptions to this rule, as in one part of England, the youngest child was the heir. Estates tail might also be called an exception, in some cases, as an estate tail female, where the daughter took the property; and if there were no daughters, the estate went to a person outside of that immediate family, the sons being excluded absolutely. In the United States, some of the States have passed laws by which any words used, in the granting of an estate, which would create an estate tail, shall be considered as creating an estate in fee simple, and by this means have abolished estates tail.

The rules of descent are applicable only to real estate, although sometimes they are incorrectly spoken of as applying to personal property also. Distribution is the proper word to use in speaking of personal property.

In many of the States there is a wide distinction between the laws of descent and those of distribution.

The laws of descent and distribution are regulated by statute of the different States, and are consequently subject to change at any time. The laws of the various States on descent and distribution differ materially, and it is therefore necessary to examine with care the statutes of any particular State in order to determine its rule on this subject.

The general rule in the United States seems to be, that real estate descends to children, grandchildren and on down in the lineal line; in default of these heirs, then to parents, and, if they are dead, the estate goes to collaterals; and if there are no heirs to the State. The law of the place where the real estate is situated is the law according to which the estate passes to the heir; and it makes no difference where the decedent was domiciled.

Descent of Man and Selection in Relation to Sex, The, a work by Charles Darwin, published in 1871. The evidences of the descent of man from some earlier, less developed form, collected and marshaled by Darwin, consist of minute differential proofs of similarity of structure, at certain stages of development, between man and the lower animals. This similarity is especially marked in the embryonic stages; and taken with the existence in man of various rudimentary organs, seems to imply that he and the lower animals come from a common ancestor. Darwin reasons that the early ancestors of man must have been more or less monkey-like animals of the great anthropoid group, and related to the progenitors of the orang-outang, the chimpanzee, and the gorilla, and that still remoter ancestors must have been aquatic. The 'Descent of Man' was received with enthusiasm by scientific men, and its influence was much greater than that of the 'Origin of Species.' It had an effect not merely on physical and biological science, but on ethical and religious conceptions. In the volumes containing the 'Descent of Man' Darwin placed his elaborate treatise on sexual selection, which may be regarded as a part of the theory of man's descent. See DARWINIAN THEORY.

Deschamps, Eustache, ès-täsh dā-shäṅ, called MOREL, French poet: b. Vertus, Marne, about 1330; d. after 1415. He composed a multitude of short poems of a political or moral nature. The 'Mirror of Marriage' comprises 13,000 lines. He wrote an 'Art of Poetizing,' the earliest work of its kind.

Descroizilles, François Antoine Henri, fräṅ-swä äṅ-twaṅ ōṅ-rē dā-krwä-zēl, French chemist: b. Dieppe, 11 June 1751; d. Paris, 14 April 1825. He studied chemistry at Paris under Rouelle, and thereafter became professor at Rouen. He especially devoted himself to the technical applications of the science. Berthollet had hardly discovered bleaching by chlorine, when Descroizilles tried it at his works at Lescure-lez-Rouen, and found that it succeeded. He collected the chlorine in water containing chalk, and thus made a step at a very early period in the direction of bleaching-powder. In the course of his operations he contrived different pieces of apparatus for the rapid valuation of commercial products. Thus his alkalimetre for the estimation of alkalies by Vauquelin's method, his apparatus for estimating vinegar (acetimetre), and for bleaching liquid (Berthollimetre), are among the earliest contributions to volumetric analysis. He also contrived a still for the estimation of alcohol in wine. He published a great many researches, especially on technical chemistry. He was the first to show that alum is a double salt.

Desdemo'na, the heroine of Shakespeare's tragedy 'Othello.' She is the daughter of a Venetian senator, Brabantio, and is drawn to love the Moor who visits her father, by hearing him relate the vicissitudes of his adventurous career. She marries him against her father's will and proves a devoted wife, but Othello, through the machinations of Iago, is led to doubt her fidelity, and, in a jealous rage, smothers her. Desdemona's character is marked by modesty, sweetness and innocent truthfulness. See OTHELLO.

Deseada, dēs-ē-ä'da. See DÉSIRADE.

Deseronto, dēz-er-ōn'tō, Canada, a town in Hastings County, province of Ontario; on the Bay of Quinte, at the mouth of the Napanee River and on the Bay of Quinte, the Grand T. and the Canadian P. R R's. It is about 132 miles east of Toronto. Its principal manufactories are lumber-mills, flour, and furniture, car shops, ship yards, chemical works, locomotive works, foundry, and iron smelting works. The chief shipments are lumber building materials, Portland cement, cars, iron, railway supplies, grist, grain, etc. The town contains churches, public and high schools, a town hall, and an opera house. Pop (1901) 3,527.

Desert, a term designating in its broadest application any uninhabited region. In its more ordinary use the word means a portion of the earth's surface that on account of its barrenness cannot support inhabitants. Four classes of desert may be distinguished: (1) Ice-wastes occupy the central plateau of Greenland, the islands of the Arctic Sea, and probably the entire Antarctic continent. (2) Tundras (q.v.) are flat plains, little elevated above sea-level, fringing the Arctic shores of the northern continents, and especially characteristic of Siberia. (3) Temporary deserts, or steppe-lands, border the Asiatic deserts to the north and west. The saline steppes of the Caspian are true arid wastes; but the typical steppes in South Russia are luxuriantly clothed with verdure and flowers in spring. In the dry season they form a dusty plain of withered herbage. The llanos (q.v.) of the Orinoco have similar characteristics, but the pampas of South America include portions perennially green and suitable for agriculture. (4) Arid wastes, or deserts in the popular sense of the word, occur mainly in two zones encircling the world, and corresponding to regions of minimum rainfall. The greater zone extends from near the equator in an east-northeast direction across the whole breadth of North Africa, as the Great Sahara, Libyan and Nubian deserts, over the peninsula of Arabia, through Persia, Turkestan, and the vast tracts of Gobi or Shamo to the confines of China. The sandy zone, thus traced throughout the breadth of the ancient continent from western Africa to lon. 120° E., has been computed to cover an area of 6,500,000 square miles; but the Asiatic portion of this tract includes many chains of mountains, and fertile valleys. The great Indian Desert in the Punjab is the only extension of this belt south of the Himalayas. The ring is completed by the Great Basin of North America in lat. 40° N. The southern zone, less complete, comprises the Kalahari Desert in southwest Africa, the interior of Australia, and districts in Chile and in the Argentine Republic.

Deserts occur at all elevations, from considerable depths beneath sea-level to many thousand feet above it, and with all varieties of surface, from a flat expanse of sand, where the view for days of travel is bounded by a sharp circle as at sea, to rocky mountain slopes rent by rough defiles bare and chiseled by the driving sand. The essential character of an arid waste is its rainlessness, and the scarcity of water on the surface and of water vapor in the atmosphere. Radiation in the clear air is rapid and desert climate is consequently of an exaggerated continental type. The sand in the Sahara becomes heated to over 150° F. during the day, and



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chilled below the freezing point at night, while the diurnal and seasonal extremes in the lofty deserts of Central Asia are much greater. Thus desert-regions are most effective in producing land and sea breezes and monsoon winds in consequence of the marked periodical changes in atmospheric density. Another effect is the mirage (q.v.), a phenomenon which, combined with the great loneliness that oppresses the occasional traveler, probably accounts for the widespread superstitions peopling deserts, above all other places, with evil and malicious spirits. The dreaded sand-storm or simoom is a kind of tornado or whirlwind which raises the sand in tall rotating columns sweeping over the surface with tremendous velocity. Sand-dunes, sometimes several hundred feet in height, are raised by steady winds, and gradually shift their position. Desert vegetation is extremely scanty, consisting mainly of hard prickly plants of the cactus, euphorbia, and spinose kinds, whose surface exhales little moisture. Animal life is correspondingly restricted both in variety and number of individuals. The camel is *par excellence* the beast of burden for conducting traffic across arid wastes. When an overflowing river, such as the Nile, traverses a desert, the land becomes richly fertile in its immediate neighborhood, and wherever springs bubble up through the sand there are oases, bearing palm-trees and grass. Artificial irrigation, especially the sinking of artesian wells, has done much to reclaim tracts of desert for agriculture in the Sahara and to a less extent in Australia, while the area of arid land in the western part of the United States, once considered irreclaimable, is being rendered by irrigation increasingly productive.

Geological considerations show that arid deserts are not permanent features of the earth's surface. The most level expanses have once formed part of the ocean bed, or at least great inland seas. The orographical changes which cut off these seas and created inland drainage areas probably at the same time modified the rainfall of the locality. Excessive evaporation dried up the great lakes, leaving at present a series of diminishing salt lakes without outlet, receiving rivers which dwindle down by evaporation as they flow. The only commercial commodities yielded by deserts are the salts (common salt (borax, sodium carbonate, and sometimes sodium nitrate) left in the dried-up lake beds. These salt lakes are subject to alternate long periods of desiccation and flooding; during the former the area of the desert extends, during the latter it contracts. These periods have been traced out in the case of the Great American Basin by a series of most interesting researches on the part of the United States Geological Survey. See GOBI; SAHARA.

Desert, The Great American. The North American deserts possess all the physiographic, geologic and climatic elements which distinguish the African desert of Sahara. The chief difference between the two regions is the relatively larger area of the Sahara, the arrangement of the topographic units and the occurrence in the Great American Desert of a wealth of mineral resources which the Sahara does not possess. Through the application of modern mechanical agencies by American energies and brain, its wastes have become inhabited by an intelligent and progressive people, and its arid hills and plains made to yield a wealth twice as much per capita as that of any other portion of the United States.

The North American Cordilleran region embraces the whole of our continent between the Great Plains and the Pacific north of the Isthmus of Tehuantepec. Of the grander scenery of the world none is more varied and beautiful than that of this region. From its northern end in far-away Alaska to the jump-off of the Mexican Plateau of the South it presents a marvelous panorama of form, color and sculpture. A few of these features are familiar by name, but the glories of the Cordilleras as a whole have not been written, for even the professional geographer has but an incomplete idea of the region as an entirety, or of its parts and their relations. In fact, much of the Cordilleran region is still so poorly mapped, that there is not yet a chart that gives a correct presentation of its great mountains and valleys. Most people, therefore, have but vague ideas of the Rocky Mountains, the Great Deserts, the western and eastern Sierra Madre, the California sierras, and the Coast ranges — any one of which is as extensive and unique a geographic unit as the great Appalachian region.

The Cordilleran region is likewise one of contrasting extremes. Within it are found every condition of climate, altitude, vegetation and productivity. The rainfall varies from the greatest in the United States (in Washington) to the least in the world (in the Death Valley and the Yuma Desert). Its altitudes range from the highest peaks on our continent (over 17,000 feet) to depressions 300 feet below sea-level. Its vegetation presents the contrast of forests of the largest and most beautiful trees in the world and vast stretches of desert plain with the feeblest mantle of struggling bush and thorn. The region is the motherland of our longest rivers, the Missouri, the Columbia, the Colorado and the Rio Grande; yet it has a million square miles without as much running surface water as the smallest New England township. It has in places mines which yield from a single acre more wealth than whole counties in many Eastern States, and it produces every mineral of the United States; yet again there are hundreds of miles of barren malpais as worthless as any ground the sun shines on. Some of its acres of agricultural soil are the most productive on earth, yielding under intensified and scientific culture the finest and most abundant crops of fruit, grain and tubers; and upon others even the cactus will not grow.

The forested Cordilleras occur in several distinct groups, which are so aligned as to constitute marginal chains of mountains bordering the Eastern and Pacific sides of the Cordilleran region, between which lie the deserts and plateaus. The chief of these groups are, (1) the Montana and Colorado groups of New Mexico, and the eastern Sierra Madre of Mexico, forming the eastern ranges of the Cordilleran region; and (2) the Sierra Nevada, Cascade and Coast ranges of the extreme western United States, and the western Sierra Madre of Mexico, constituting the Pacific or western ranges.

The remainder of the Cordilleran region, including the vast stretches lying between the Sierra Nevada of California and the eastern Cordilleran ranges (Rocky Mountains) in the United States, and between the Pacific Ocean

and the eastern Sierra Madre of Mexico, constitutes the Great American Desert.

Of the total area of the Cordilleran province, three eighths are forested mountains, one eighth plateau, and one half waterless, treeless, turfless mountain and valley desert. The deserts occur in Nevada, Utah, eastern and southern California, Arizona, New Mexico, and all of Texas west of the Pecos, 550,000 square miles. The American Desert is international, however, for in addition to the above area within the United States, it continues southward into Mexico, where it includes most of the states of Sonora, Chihuahua, Coahuila, San Luis Potosi and Sinaloa — another 500,000 square miles — making a total of 1,050,000 square miles which, although one third the area, is as truly a desert in every natural sense as is the Sahara, which embraces an area of 3,500,000 square miles, and has a population of 2,500,000 people.

Through the area mentioned, the Great American Desert stretches southward far into the tropics, a marvelous country, unique in every feature of landscape and vegetation.

In its entirety (with a few exceptional forested summits) this desert province is one of barren, stony mountain ranges, separated by equally barren stretches of desert plain, an aggregation of elongated arid plains and lower mountain ranges, which mostly follow the axial line of the Cordilleras. The individual deserts have many names, and each differs from the others in some minor aspect.

From a technical point of view a desert in its ultimate analysis is a region in which the rainfall is insufficient to produce run-off. The light rainfall, striking the heated rock surfaces and sandy soils, is soon evaporated or drunk in; even the large bodies of water which may start down the mountain sides as roaring torrents usually die out at the margins of the plains. These waters are highly charged with mineral salts derived from the heated rock surfaces, and these salts are readily redeposited upon the surface or in the interstices of the permeable sands. The torrents locally transport the rock debris — boulders, pebbles, and powder — from one locality to another, but only for short distances; and hence the desert plains are usually composed of the debris of the adjacent mountains, which in more humid regions of ample run-off would have been carried to the sea. The expansion and contraction from the daily temperature causes the desert rocks to fracture *in situ* into the desert waste. This is distributed by wind and torrent, and hence the features of the desert are largely air-made as well as water-wrought.

The scarcity of moisture results in the absence of vegetation of the root-twining, soil-gathering, and soil-making type that distinguishes the humid region. Every plant and species attests the aridity of the country. Exactly as in the Sahara, these plants are thorny, coriaceous bushes and shrubs of the cactus, aloe, and acacia families, adapted to withstand their droughty environment, and to defend themselves from attack by man or beast.

Physiographically there are two sub-provinces of the Great American Desert, lying to the east and to the west of the western Sierra Madre and Colorado Plateau respectively. The westernmost of these may be termed the Nevadan and the eastern the Chihuahuan. The western, or Nevadan, Desert occupies much of the area of Utah, Nevada, Mexico, southern and eastern California in the United States, and the states of Sonora and Sinaloa in Mexico. The Chihuahuan Desert occupies the vast area of country lying between the eastern and western Sierra Madre of Mexico and their northern continuation into southern New Mexico and Texas west of the Pecos, and is the so-called Mexican Plateau.

The Great Basin Desert is marked by wide flatness, and is largely a region of ancient lake beds. Its surfaces are in many instances what the geologists term constructional, and its flora is mostly sage brush and grease wood; its agricultural products cereals and tubers; and its minerals gold, silver, and copper. The Sonoran Desert is of a more complicated geological type, and instead of being land-locked is bordered on one side by the Pacific Ocean. Some of its surfaces are also the result of what geologists term destructional processes. Its floral types are the saguara, the palo verde, and the cats-claw. Its sparse agricultural products are fruit and wheat, its mineral resources gold and copper.

The Chihuahuan Desert, marked by parallel plains and ranges, is a relatively higher region; its features are a combination of destructional and constructional processes. Its floral types are the maguey cactus and yucca; its chief agricultural product maize (corn), and its principal mineral product silver.

While the desert plains may be extensive, they also have many phases of variation. There are the alkali plains, white crystal patches of saline efflorescence which vegetation abhors, and vast plains of "doby" (adobe) — brownish chocolate clay soils through which here and there are cut the deep channels of streamless streams. There are the dreary "tabosa" flats covered by headlike bunches of a woody grass, abhorred by animals and useless to man, through which one may travel for days. The great white gypsum desert of the Tularosa valley of New Mexico is one of the most wondrous of all the desert plains. To the eye it is a veritable sea of purest granular snow, marked with wind waves and ripples like the Tropic Ocean, with billows and troughs. Yet it is not snowlike in its torrid heat, which burns and thirsts more than man can tell. In some places there are extensive lakes of crystalline salt which the desert inhabitant uses for herd and flock. Sometimes there are stretches of dreary brown sand hills, great billows gathered around the protecting roots of the thorny mesquite, the particles blowing with each breath of wind, ever seeking a resting place, though seldom finding one.

The half cannot be told of the many other aberrant features of the Great American Desert, like Death Valley, with which no spot in Sahara can compare for sterility and desolation; the great "medanos" or white sand dunes just south of El Paso, each as high as the national capitol, which creep from place to place over the desert plain; the vast plains of malpais in New Mexico with their burning, cutting, black, waterless surfaces of lava; the "flour dust" deserts of Jimenez and Arizona and Sonora, where the traveler is choked with clouds of chalk-white powder; the Crow Flat with its glare that blinds, the Jornado del Muerto, with its hundred whirlwinds, the saguara deserts of Sonora, where



A TYPICAL VIEW OF THE AMERICAN DESERT.

for hundreds of miles grows no blade of grass, or many other spots which are apparently a mockery of nature.

The clouds are the most wonderful manifestations of the desert heavens. The forms of vaporous atmosphere are numerous. In the morning they fill the valleys with snow white vapor, which at midday rises and gathers into solitary fluffs sailing majestically along like great icebergs in a sea of azure ether, or again breaking into small bunches like flocks of sheep. Frequently from one little handful of cloud surrounded by golden sunshine, a ribboned spray of rainfall may be seen dropping upon some lonely spot. Toward night they gather in rolling banks and settle upon the mountain tops, rapturously lingering near the horizon, where they are painted by the setting sun in floods of glorious gold and violet.

Sometimes showers freshen the desert. These are occasionally of sufficient volume to dampen the earth and vegetation, and an awakening of life ensues which is most remarkable. From every shrub and cactus comes a burst of song from birds ordinarily unnoticed. Rabbits creep out and browse, coyotes give tongue in chase of prey. Vegetation seems to awaken instantaneously, plants which before were dry and dust-covered unfold into broad areas of vivid green. Coriaceous ferns, ordinarily lying like dead leaves among the stones, unroll and wave their fronds in the freshened air. From the inconspicuous flowers of the many thorny shrubs of the acacia and yucca tribe the air is laden with perfume.

It would seem paradoxical to speak of the desert in bloom, but the human senses of sight and smell can be regaled by no more pleasant experience than the delicate odors and sweeps of color that sometimes follow an unusual rainfall. Sweeter than the dewy jessamine is the scent of the yellow catsclaw; more delicate than mignonette is the panule of the mesquite.

Like a dainty pencil line drawn across the sheet of desert, the trails may be seen for miles and miles. These, originally made by the wild Comanche and Apache, lead in long tangents from water-hole to water-hole, cutting paths of deep-worn ruts. Were it not for these trails connecting the various water places the desert probably would be impassable, for the priceless water is usually concealed in spots where least suspected. These water-holes were discovered by the aborigines long before the ranchman and settler came or the army wagons and cavalry troops deepened the impress of the trails. What stories of death and pain, thirst and starvation could be told by these old trails! We know that as early as 1528 many of them existed, for in that year Cabeza de Vaca and his three shipwrecked survivors of the Navaez expedition followed these paths from water-hole to water-hole across our southern border, and that modern commerce and migration still use these, the oldest and most stable monuments of the desert.

In the desert water is king. Without its countenance priceless ore is but as dross, and fertile soils are as worthless ashes. Upon the desert plains many men and cattle have died for the want of a drink of water, which millions could not buy. Water is not only the king of the desert, but its despot. It smiles at the millions of acres of land owned by a certain university as a part of its endowment which is still ungraced by its favor. It laughs at the waterless miles upon which the United States invites settlement under the homestead laws; it defies those who would take the rich gold from the placers of the deserts of Sonora and Arizona, where the gold would remain forever without its precious favor.

Like the Sahara, the Great American Desert is superficially waterless. Its plains are usually barren of surface water save for an exceptional saline lagoon. A few brooks, streams, or rivers arise within its larger mountain ranges, but no water ever runs off its surface to the sea. Even the great floods of water which sometimes burst from an erratic cloud with devastating effect are rapidly swallowed up by the sands or evaporated by sun and wind. It is true that there are two long rivers comparable to the Nile of the Sahara — the Colorado and the Rio Grande — which rise in the higher forested mountainous border lands and flow into and across the deserts like great canals, without gathering contributary drainage from them, losing volume in fact from absorption and evaporation in the desert portions of their courses. These are rivers born of the mountains, however, and not of the deserts.

Upon the area of the Great American Desert the maximum rainfall is less than 15 inches per annum, and does not average more than 10 inches. In places such as Death Valley and the Yuma Desert it is less than five inches, these two spots being perhaps the driest in the known world. Deducting from this maximum of 15 inches 60 per cent of its effectiveness, due to loss through evaporation, the actual rain value is only six inches per annum, less than the amount falling in the two crop-growing months of May and June in the eastern States, and less than one half the quantity that fell in September 1901 in a single 24 hours at Galveston, Texas. To this great natural fact the desert is resigned, that within its area the land with a few exceptions, not amounting to 3 per cent, is permanently and hopelessly dry, and even the most sanguine cannot refute this fact.

Before the railways came, the Great American Desert was a most primitive region. In 1880 it was inhabited by a population about as dense as that of the Sahara now, but practically in the same state of culture; and the mission bells rang over the same civilization that existed in 1528. The inhabitants practised irrigation, agriculture, and architecture very much like that of the Egyptians of to-day, and constructed dwellings of unburnt brick and stone. The aborigine found sustenance on the desert, but of a kind upon which the white man could not well exist. Maize was his staple of diet. This with the tunas (fruit of the prickly pear) and the roots of various yuccaceous plants, supplemented by a few wild animals, provided an aboriginal diet pure and simple.

It was no great feat for the Spaniard who already possessed an Old-World knowledge of desert craft to amalgamate with the aborigines. He gave to them a few domestic animals (the goat and the burro, which can live where other animals starve). He also gave to them the Catholic religion and the Spanish language. For nearly 400 years the desert population made no progress in industrial civilization beyond adopt-

ing the wooden plow and the cumbersome wheeled cart known as the *carretta*.

In Mexico the old desert cities and country estates were practically in the same status of civilization that existed in the 1st century after discovery. The cities had no commerce except by caravan; the estates were great feudal districts with their fortified *haciendas*, to which all the surrounding people were attached as fiefs. For 200 miles along either side of the international border in Mexico and our own desert country the unconquered Apache spread devastation from the Pecos to the Colorado; and the only white men there were the soldiers at scattered and lonely outposts, or "bad men" endeavoring to hide from civilization, and hardly better than the Apaches in instincts or action. Here and there in the United States at the widely dispersed water-holes were a few nomadic ranchmen who owned cattle of primitive breed for which there were no purchasers, except the army and beef contractors. Some mines there were also, but these were merely those with easily reducible ores and limited in depth by the distance which a man could dig in solid rock without machines or powder, and from which burdens could be carried on the human back. In Utah alone had the white man attained a foothold, but the Mormons were men who sought the desert to escape civilization, with the ambition of reverting to a culture as purely barbaric as that of Abraham and his descendants who now live in the Sahara.

With the advent of the railroads the modern conquest of the desert began. It was first awakened from its centuries of lethargy by the whistle of the locomotive in the eighties. In the Great American Desert in the United States and Mexico there are now more than 9,000 miles of railway. But for the railroad the Great American Desert would to-day be as unproductive as the Sahara, and still populated, like the Sahara, by people who exist without division of labor, the use of mechanical appliances or extra-territorial commerce. The first railways to be constructed were designed merely as highways between the Atlantic and Pacific seaboards. No thought of revenue from the desert itself was anticipated. Next came a great longitudinal line following the ancient trails of the Aztec from Mexico to Santa Fé. Mining and population soon followed these trunk lines, which are now extending out even into the utmost recesses of the desert, and these feeders — built or in process of construction — will soon equal the aggregate of mileage of the original trunk lines. From the Pecos in Texas to California, a distance of 1,500 miles, the route of the Southern Pacific followed a belt of country devoid of water except occasionally in the Rio Grande. Not a herd of cattle, a modern house, a farm or a mine existed along this desert stretch. Nor would they exist to-day had it not been for the construction of this railway. Now its course is marked by many prosperous embryo cities and villages.

Notwithstanding the apparent scarcity of water, one of the most remarkable features of the American Desert is that water has been secured, often in apparently impossible places, and in quantities which have made possible the existence of cities and industries. Like the deserts of the Sahara and Asia, those of America have a supply of underground water; there is hardly a desert in which the experiment has been tried where waters have not been found within 2,000 feet of the surface. Though not often sufficient for agriculture, enough has usually been found to afford a supply for cattle, railroads, and mines.

Underground water has usually first been found by the railway companies. When the track was first pushed across the desert water was brought from the rear in tank cars; but when the track was completed water was bored for in the desert itself. The engineers have had at command a mechanical appliance second only in importance to the locomotive, and one which in the desert usually goes side by side with it. This is the mechanical drill. At great expense they bored in many places. The existence of underground water beneath any particular area having once been demonstrated by the railroad company, individuals, of course, usually repeated the experiment. Three notable triumphs of the mechanical drill over nature are the flowing wells of the Salton Desert, the flowing well at Benson and a supply of 700,000 gallons a day from the deep wells on the Mesa at El Paso. Each of these supplies of water was obtained from localities which superficially were hopelessly dry.

Several of the largest mines in the desert depend almost entirely upon the water transported on cars. The Copper Queen runs its vast smelters and machinery chiefly by water thus obtained, while the famous Sierra Mojada, of Coahuila, with its population of 5,000 people, has not a drop of water except that brought in tanks a distance of 125 miles. Yet these two mines annually return millions of profit.

But the sterile and hopeless-looking soil of the desert, when artificially watered, is apparently more fertile than that region where rainfall is abundant. There is no nobler spectacle than a dreary waste converted into an emerald oasis by water artificially applied, and in the desert may be seen some of the most profitable and skilful agriculture in the world. The wheat fields of Utah and Sonora, the great cotton farms of Coahuila, the alfalfa valleys of the Rio Grande and the orchards of California are all inspiriting examples. The transformation made in the desert where irrigation has been possible is marvelous, and in one instance — in Southern California — has resulted in the development of communities of great wealth and culture, where the ideals of perfect conditions for existence are as nearly attained as possible.

A word of caution must be written, however, against an overestimate of the agricultural capacities of the desert. It is necessary artificially to collect the precipitation over large areas, and to concentrate it upon smaller areas by impounds and canals. In this manner at least 25 acres must be set aside as unproductive catchment areas for every one that may be cultivated. All rain water that falls upon the desert or upon its neighboring mountain, if it could be protected and carefully preserved, would not irrigate 5 per cent of the great desert area. The efficiency of the rain of the Great Desert region for agricultural purposes is still further diminished owing to the season in which it falls — June to October — too late for the growing crops, the planting and growing months of spring and early summer being dry. From a practical standpoint it is doubtful if even 1 per

cent of the vast area can ever be profitably tilled by irrigation. The underground water supply, too, is entirely insufficient for extensive agricultural uses, even when it is free from injurious salts; and the desert people, after every possible experiment, have long since ceased to anticipate any material supply for irrigation from this source.

From whatever point of view the problem is approached, the sober conclusions cannot be avoided that the desert as an agricultural country has its limitations. The only apparent way in which the area of irrigable lands can be seriously increased is by the construction of reservoirs to save the run-off of the forested mountains, especially that portion of the desert adjacent to the California, Utah and Mexican sierras. Even when this is accomplished there will still be left a vast area of desert. Hence the agricultural product of the desert will never be large, and this product with the exception of the fruits of Southern California will contribute but little for export, and will never be sufficient to supply the needs of its own population. The Great Desert is and will continue to be a profitable market for the consumption of the fresh and preserved food products and forage of the ocean seaboards and Middle West.

Notwithstanding the scarcity of water and forage the pastoral interests of the desert are considerable. Upon the stony foothills and in the mountain cañons the scant herbage and grass supply nutritious foods for many animals, and there are numerous cattle ranches, especially in the Chihuahua province, which are profitable and thriving. Statistics are wanting and hence exact figures cannot be given, but the live-stock values of the desert amount to several million dollars, exceeding the agricultural products many fold.

So far as even the present agriculture in the desert is concerned, it would not exist were it not that its products were consumed at good prices by the people engaged in mining and transportation. One good mining camp, a few acres in extent — and there are many of these — gives employment and remuneration to more people than whole countries of arid farming lands. Previous to the introduction of the railway, mining in the desert was limited to simple processes and products. Without mechanical drills and hoists only moderate depths could be reached, and limited quantities of ore taken out and treated. Consequently the deeper, larger and richer ore bodies remained untouched. Silver and gold were alone considered, and the mines which now yield over $50,000,000 annually of copper could not be touched.

On the California trail near Pearce, Arizona, for 40 years the overland pioneers built their camp-fires against a ledge of quartz. Since the railway came these rocks are being crushed for the gold they contain at one of the most complete and profitable mills in America. The huge stamps and other machines were brought from New York, Pittsburg, Chicago and Denver; the oil for fuel to run them, from California; the food for the village of over a thousand people living in homes built of Texas lumber is all brought in from the great canning, packing, and fruit-giving sections of the country.

A dozen other places in the desert, each with its modern hoists, smelters, converters and electric appliances, are producing millions of mineral wealth per annum. Not only have new mines been opened and equipped, but many of the historic old mines of Mexico, abandoned because the limit of hand mining had been reached, have been re-opened with the aid of the steam-hoist and air-drill, and to-day are more productive than ever.

The Great American Desert in 1900 yielded over $100,000,000 worth of metals — chiefly silver, copper and gold. This represents at 10 per cent a productive capital of $1,000,000,000. In addition to the paying mines, as large an investment is now being made in mine development and preparation for the coming of lines of railway which are everywhere reaching out to new mining fields. There is every possible reason to expect that the mineral output of the desert will be quadrupled the next decade. Mexico's production of gold has increased from $4,000,000, in 1897, to $10,000,000, in 1901; Arizona and New Mexico produced $3,500,000 worth of gold in 1901. Silver, instead of being a dead metal, is being mined with renewed activity and improved appliances. The American Desert, in 1901, yielded about $8,000,000 from the United States, and $34,000,000 from Mexico.

The smelting interests are not the least important adjuncts of the mining industry, and each smelter gives employment to many workingmen. The American Smelting and Refining Company, with its capital of $80,000,000, has great central plants in the desert at El Paso, Aguas Calientes and Monterey. Many of the mines like Boleo, the Copper Queen, the United Verde and Greene Consolidated have their own smelting works.

Many mineral districts of the desert still lie unproductive for want of transportation. This is especially true of the great copper, gold and coal fields of the Pacific States of Mexico, while the rugged western Sierra Madre contain veins of ore awaiting transportation facilities which will furnish many new and important mines.

The total population of the Great American Desert in 1900 was about 1,500,000 people or 1.5 to the square mile, or twice as many to the square mile as the Sahara. Of this total population in the United States, 300,000 are in southern California, leaving less than one person to every two square miles in the remainder of the territory. Of the remaining 700,000 people in the American portion of the desert, at least four fifths are in cities, towns and mining camps. These people in their own picturesque language are by profession "prospectors," "punchers," "nesters," "miners," "lungers," "Mexicans" and "promoters." In plainer English, mineral seekers, cattle men, irrigator-farmers, miners, railroad employees, health-seeking consumptives and laboring Indians, who have abandoned the "blanket" caste, and men who serve as intermediaries between the latent wealth of the desert and the ready cash of the East. As a whole they are an energetic lot. In the United States they consist chiefly of two classes, the Caucasian, whose ingenious brain conceives and develops industries and the Mexican (Indian) peasant, who does most of the manual labor. Across the line in Mexico the same conditions exist, except that the American finds a ready co-operator and companion in the higher caste of Mexican citizens.

The mainsprings of the desert are the hustling western American miners and cattlemen. If any of our readers should still retain in his

mind as a type of the desert citizen the bad man with the slouched hat, flowing mustaches and quick-acting revolver, he is at least 10 years behind the times. Whether from the magnificent climatic conditions which induce healthfulness or from the fact that he represents the survival of the fittest, he comes very near the highest type of an American. Self-reliant, unaffected, well built, well dressed, well read and well traveled, he is a man of resources and action, available for any emergency, freer from provincialism, and a little more cosmopolitan than the average resident of any other section of our republic. The aboriginal population of the Great American Desert was and is of quite a different type from that of the nomadic savage who lived by the chase, in the forested mountains and upon the Great Plains. They were largely village dwellers, home builders and agriculturists who by the arts of pottery and weaving had risen to the cultured stage of barbarism as distinguished from savagery. It was their social arts and habits of industry which produced the highest aboriginal type in the ancient Aztec, and it is their blood (not the Spanish) which to-day constitutes the ruling spirit of the most advanced of the Spanish-American republics (Mexico). Upon the invasion of their environment, first by the Spanish and later by the Anglo-American civilization, they assumed at least a portion of these and to-day they are the people who constitute almost the sole laboring classes of the desert, being called Mexicans in the United States and peons or peasants in Mexico.

It is the intensity rather than the density of the desert population that appeals to the observer. Whatever is done is done better than elsewhere. This is a necessity of the desert condition. It will not pay in that region to trifle with inferior methods or products. In mining the best man and the best machine must be had; in farming with expensive water it is a waste to plant poor seed; if cattle are placed on the range they must be good cattle, and so on throughout the entire gamut of industry. The conquerors of the desert seem to inspire a higher plane of living than that met with in the older rural regions and crowded industrial centres of the United States. There is no quibbling over innovations; if good they are adopted. The universities and agricultural and mining colleges of New Mexico and Arizona would be creditable to any country and they are hampered by no quarrels over dogma or political opinions.

The desert cities, if not as densely populous as those of some regions, are unique in their thrift and prosperity. They are all picturesque communities, presenting an interesting mixture of architectural, social, and business conditions, busy with commerce and buoyant with hopes and prospects. Each desert city is thoroughly alive to municipal improvement and development. Electric lights and street cars, waterworks, schools, churches, and public libraries abound, while many of the American towns have copied from their Mexican neighbors the picturesque plazas or ornate public parks within the central portions of the busy cities. In many of the Mexican desert cities may be seen the union of all the best of modern industrial improvement with the picturesque Spanish architectural features for which these places are noted. Steam and electricity have asserted their mastery, but have concealed their cold mechanism behind the prettily stuccoed and flower-entwined walls of the artistic Mexican type.

The Great American Desert as a place of residence is one of the most salubrious on earth. The same climatic feature which renders it sterile — want of humidity — gives to its air a crystalline clearness and purity nowhere else found. At first sight the desert horrifies the passing traveler, but he who dwells in it for a time learns to love its life-giving air and landscape. In the noble wastes of rock and plain man's soul swells to contemplation and forgets the dross and sham of his artificial civilization. The endless vistas uplift the thoughts, and the skies seem to bring with them a clearer vision and content than all the mist and fogs that ever hovered over a humid landscape.

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Desert Animals. Men are apt to think of the vast tracts of absolutely treeless arid sand as uninhabited, because they are void of the creatures known to the regions where humanity dwells. Yet these tracts are often teeming with life. On the shadowless expanse which affords no lurking-place, animals, adapting themselves to the exigencies of their life, often assume the pale tints of the sands whereon, by lying motionless, they may be overlooked by their enemies. They not only develop a protective coloring, but acquire certain other capabilities. They learn, for instance, to subsist on a minimum of water, or to store it within their bodies, some, indeed, developing an ability to live altogether without direct water-supply. Many desert animals are said to æstivate, that is, to sleep throughout the summer, as animals of cold climate hibernate by lying dormant through the winter season. The desert snail, in order to protect itself from dessication, builds up a wall of mucus, sometimes with two or three layers, across the opening of its shell to prevent evaporation of its moisture during the extremest heats. Small desert animals, like plain-dwellers, are burrowers, not only because they can thus escape the fierce rays of the sun, but also because they are so protected against their enemies. Even some serpents burrow, and these are more virulently poisonous than corresponding species of a different habit. All the desert creatures, from the snakes and lizards to the camels, are provided muscularly with the ability to shut out from their nostrils and eyes the sand that is blown by the powerful winds; and most of the insects (except the locusts) are practically wingless, so that these strong desert currents do not carry them away.

The large desert animals are swift, and their feet are adapted for the hot rocks and sand by being cushioned beneath with callous skin. The swiftness of these animals is indispensable to their preservation; for they must generally escape their pursuers by flight, since their habitat affords no hiding-places; moreover, they have to travel long distances for both food and water. Examples of this may be found in the camel and ostrich (qq.v.).

The desert is undoubtedly the refuge of certain animals which have been driven by competition from the more desirable habitations, and which, having located in arid land, have adapted

themselves to their unfavorable environment. That they are the unsuccessful and outcast representatives of species living under better conditions is substantiated by the fact that they are almost always closely related to the forms in the fauna of the green, fertile lands beyond the desert; the differences usually being only the changes necessitated by difference of habitat.

Desert Land Act, a statute of the United States passed 3 March 1877, and supplemented in 1891, to encourage irrigation by private individuals or associations. It provides that any citizen or intending citizen, by paying a registration fee of 25 cents, and declaring his intent to irrigate within three years, may occupy desert land not exceeding a section (640 acres) in any of a number of specified Western States and Territories, and if he reclaims it within that time may receive a patent for it. He must spend at least $3 per acre in irrigation or securing water rights; and must have secured the rights before making application. Associations may file joint declarations.

Desert Plants, such plants as are characteristic of arid regions; in general marked by structures adapted to check transpiration of water, such as reduced leaf-surface, absence of leaves, thickened epidermis, hairy or waxy coverings, stomata ("breathing apparatus") in sunken pits, the entrances to which may or may not be protected by hairs, perennial underground parts such as bulbs, tubers, rhizomes; and annual plants which flourish during the wet season, where such occurs, and, like the tops of many of the perennial herbaceous species, die during the dry season. On the other hand water-absorbing organs are often highly developed; the root-systems are not only large but the root-hairs are exceedingly numerous. Storage organs other than underground parts are common, as in many plants with fleshy leaves and in the thick stems of cacti. In regions of less and less rainfall the vegetation becomes more and more monotonous and restricted to the most resistant forms. In addition to intense heat and light, drying winds and small rainfall, the plants have often to adapt themselves to withstand salts which are brought to the surface in solution and left as the water evaporates.

Structural differences and similarities may be observed in the plants characteristic of Alpine and Arctic conditions. Another striking character of desert plants is their restriction to a limited area (see ENDEMISM) by isolation and by enforced adaptability to peculiar conditions, in which respects desert and Alpine plants are similar, but in which each differ from Arctic plants that have a wide range. See ALPINE PLANTS; ARCTIC PLANTS; HALOPHYTES; PLANT GEOGRAPHY; XEROPHYTES.

Desertas, dā'sĕr-tȧs, a group of three small rocky islands in the Atlantic Ocean, to the southeast of Madeira, visited at certain seasons of the year by fishermen and herdsmen.

Deserted Village, The, the title of a poem by Oliver Goldsmith (1770). It is supposed to describe the village of Lissoy, in the County of Westmeath, Ireland. See GOLDSMITH, OLIVER.

Deserter, in military affairs, a soldier or sailor who quits the service without leave. In the United States desertion from the army or navy in time of war is subject to court-martial which nearly always means a sentence of death. Desertion under ordinary conditions is punishable by dishonorable discharge and five years' hard labor. The United States government offers a monetary reward for the arrest and delivery of a deserter, the sum usually ranging from $20 to $30. In every civilized country the laws against desertion are similar to those of our own land — always severe upon the man who abandons his duty, punishing him with harshest discipline, and sometimes, death.

Desertion by either husband or wife without lawful reason is sufficient cause for legal separation, or instituting proceedings for divorce. A wife, however, may secure an order to protect money or other possessions she may acquire from the time of desertion. This makes her property immune against husband or his creditors. On the other hand the husband is not held responsible for any debt or contract his wife may engage in during her voluntary leave of his "bed and board." In nearly all parts of the United States, as well as in countries of Europe, desertion is good ground for divorce, though there are differences as to the period of time which must elapse before action can be instituted.

Desfontaines, Pierre François Guyot, pē-ār frăṅ-swä gē-ō dā-fôṅ-tān, Abbé, French writer: b. Rouen 1685; d. Paris 1745. He was one of those known to us more for their controversies with Voltaire, and his biting attacks, than from their own productions. Voltaire, by the superiority of his wit, succeeded in gaining many to his opinions; but impartial judges have long agreed that he was not altogether correct, and that the criticisms of the Abbé Desfontaines, though severe, are by no means unjust. One of the works of the abbé, which had the misfortune to excite the particular displeasure of the poet, was the well-known 'Dictionnaire Néologique,' of which the sixth edition appeared in 1750 and which was intended to guard the purity of the French language, as the great writers of the 17th century had formed it; and in this respect it has certainly proved of much service.

Desful, dĕs'fool, or **Dizful,** dēz'fool, Persia, city in the province of Khuzistan, 30 miles northwest of Shuster. About 30,000 inhabitants.

Desgoffe, Blaise Alexandre, blāz ä-lĕks-ändr dā-gôf, French painter: b. Paris 17 Jan. 1830. He is famous for having imitated jewels and trinkets with pastes, and transparent coats of color. Among his works are: 'Oriental Agate Cup of the 16th Century,' after the original in the collection of jewels in the Louvre; 'Oriental Vase on Enameled Pedestal of the 16th Century'; 'Amethyst Vase of 16th Century,' Luxembourg; 'Onyx Jug'; 'Money Bag of Henri II., Enamels of Jean Limonsiu,' Luxembourg; and many fruit and flower pieces.

Deshoulières, Madame Antoinette de Ligier de la Garde, äṅ-twäṅ-ĕt dė lē-zhē-ā dė lä gärd dā-zoo-lē-ār, French poet: b. Paris 1 Jan. 1638; d. there 17 Feb. 1691. During the war of the Fronde she followed her husband into exile at Brussels, and he rescued her after she had been for eight months imprisoned at Vilvoorden as a suspicious personage. She was called the 10th muse and the French Calliope on account

of her idyls 'Les Moutons' and 'Les Fleurs.' Her subsequent failure in writing tragedy caused this advice to be given her: "*Retournez à vos moutons.*" Her best work and inspirations are found in her 'Idylls,' especially in 'The Sheep,' 'The Flowers,' 'The Birds.' Voltaire was of opinion that of all the French poets of her sex she had the greatest merit. Several learned societies elected her a member, and her agreeable manner, her animation and wit, which sometimes, but rarely, gave way to a gentle melancholy, made her the centre of attraction in the best societies at that period.

Desicca'tion, the evaporation or drying off of the aqueous portion of bodies. It is practised with fruit, meat, milk, vegetable extracts, and many other matters. It is usually done by a current of heated dry air, and as such may be considered as distinguished from evaporators, so called, to which furnace heat or steam heat is applied.

Desiderio da Settignano, Di Bartolommeo Di Francesco, dē bar-tō-lōm-mā'ō dē fränchĕs'kō dā-sē-dā're-ō dä sĕt-tēn-yä'nō, Florentine sculptor: b. 1428; d. 1476. He was a pupil of Donatello. His chief work is the tomb of Carlo Marsuppini, chancellor of the Florentine republic, in the church of Santa Croce. Another church in Florence possesses a statuette of the Infant Jesus by this sculptor, of which there is a replica in the Louvre. The genuineness of many busts attributed to him has of late been disputed.

Desiderius, Lombard king. He was the last ruler of the Lombards and after being besieged in Pavia by Charlemagne was carried captive to France.

Design, in painting, the first plan of a large work, drawn roughly, and on a small scale, with the intention of being executed and finished in large. See Drawing.

In music, design means the invention and execution of the subject in all its parts, agreeably to the general order of the whole, especially in the composition of works of classical formulæ as required by a sonata or symphony.

In manufactures, design expresses the figures with which the workman enriches his stuff or silk, and which he copies after his own drawing, or the sketches of some artist.

In architecture, a plan of an edifice as specified by the ground-plans, elevations, sections, and any other outlines necessary to guide its construction.

Design, Schools of, schools in which art is taught with an industrial application in view rather than a purely æsthetic end. Theoretically such schools may be considered as intermediate between schools of technology, in which (with the exception of the architectural courses) designing is of a purely mechanical nature and application, and schools for the training of artists; yet in actual practice this distinction is not always followed. The best results in applied art are produced by foundation work similar to that essential in preparation for a distinctively æsthetic career. The courses in such schools vary in detail but generally include most of the following branches: free-hand drawing; the theoretical principles of decoration, and the history of art — especially in its decorative aspects; copying and variation of designs; original designing for textile fabrics, wall-paper, stained-glass, pottery, leather-work, book-covers, etc.; and the study of the best examples of designing — for which accessible museum collections are essential. To this is added instruction in technical manipulation.

The definite endeavor to promote art education with the purpose of developing and improving the art industries of the nation had its rise in England as a result of the first international exhibition, that of 1851, at Hyde Park, London. In the United States a similar movement originated in Boston in 1870, and was an outcome of the former. The related branches of industrial art drawing and manual training owed much to the impetus given by the Centennial Exhibition of 1876. The new spirit was felt by the public schools and wrought marked changes in them during the next quarter of a century, and museums of art were created and developed. Among the institutions offering courses in applied art in the United States, may be mentioned the schools of Cooper Union; the Lowell Free School of Industrial Design (1872), affiliated with the Massachusetts Institute of Technology; the School of Design for Women in Philadelphia; the School of Design of the University of Cincinnati; and the University of Minnesota, which has a four years' course in drawing and industrial art. The large cities of Europe were provided with facilities for teaching industrial art long before such a necessity was apparent in Great Britain and the United States. In Paris the École Nationale et Spéciale des Arts Décoratifs, in Berlin the Bau Akademie, and in Vienna the Imperial Art Institute, may be especially noted. The great schools devoted to the training of artists created the atmosphere and impulse without which the more practical schools would be impossible, but they hardly come within the scope of this review. Among the results produced in Great Britain by the recognition in 1851, of the superiority of France in the arts of applied design, was the creation of the South Kensington Schools and Museum of Art, which have been powerful factors in effecting the great change in that nation. See Art Education.

Désirade, dā-zē-räd, an island of the West Indies, dependency of Guadeloupe, from which it lies about nine miles to the east. Since 1814 it has been a French possession. It has an area of 10 square miles, and a population of about 1,300, composed mainly of emancipated slaves. It is known as the island which Columbus first discovered on his second voyage in 1493, and to which he gave the Spanish name Deseada, "desired."

Desjardins, Alphonse, Canadian journalist and politician: b. Terrebonne, Quebec, 6 May 1841. He was educated at Masson and Nicolet colleges, and was admitted to the bar in 1862. In 1868 he turned his attention to journalism, was on the staff of 'L'Ordre,' and later became editor-in-chief of 'Le Nouveau Monde.' He assisted in organizing the Papal Zouaves sent to the aid of the Pope in 1868, and is a member of the Order of Pius IX. He was a member of the lower house of the Canadian Parliament 1878–92, and was then called to the Senate. In 1893 he was mayor of Montreal, and in 1896 for a short time minister of militia, and then minister of public works.



Arabic, Byzantine, and European Designs of the 15th and 16th Centuries.



European and Asiatic Designs of the 17th and 18th Centuries.

Desjardins, Martin, mär-tăn, gallicized name of **Martin Vanden Bogaert,** French sculptor: b. Breda, 1640; d. Paris 2 May 1694. He excelled as a sculptor, decorator, and wood-carver, executing many works for the churches of Paris, the College of the Four Nations, palace of Versailles, etc. His chief work was a monument to Louis XIV. 1686, removed in 1792 and destroyed save a few parts now in the Louvre and the Invalides. Another Louis XIV., an equestrian statue, remains at Lyons, with several portraits in busts and bas-reliefs at the Louvre and at Versailles.

De Smet, dē smĕt, **Peter John,** American Jesuit missionary to the Indians: b. Dendermonde, Belgium, 31 Dec. 1801; d. St. Louis, Mo., 23 May 1873. In 1822, being yet only a scholastic in the order, he was sent by his superiors to join the Jesuit mission in the United States and was an instructor first in the Indian school at Florissant, Mo., and then (1828) in the university newly founded at St. Louis. After this, having been ordained priest, he entered on his destined field of labor as missionary to the aborigines, traversing on foot or in canoes or with whatever means of conveyance was possible, the regions inhabited by the Potawatomies, Sioux, Blackfeet, Flatheads, Pend' Oreilles, and other tribes in the valleys of the Missouri, Yellowstone, Platte, and Columbia, and on both sides of the Rocky Mountains.

On many occasions he was a commissioner on behalf of the United States government in pacifying the redmen when, provoked to fury by the wrongs done them, they went on the war path. In his journeys he wandered over 100,000 miles in those wildernesses in the course of his labors of 40 years. But in the meantime he made visits to Europe repeatedly, to collect funds for support of the missions and to enlist young men for labor in the same field.

His collections in Europe amounted to 1,000,000 francs. He wrote several narratives of his experience in the western wilds, among them: 'Letters and Sketches of a Residence in the Rocky Mountains' (1843); 'Oregon Missions' (1847); 'Western Missions' (1863); 'New Indian Sketches' (1868).

Des Moines, dē-moin, Iowa, city, capital of the State, and county-seat of Polk County; near the geographical centre of the State, lon. 16° 43′ 52″ W.; lat. 41° 35′ 45″ N. It is situated at the junction of the Des Moines and Raccoon rivers, and is entered by 12 steam railroads and 4 interurban electric roads, operating 70 miles of track. The city is built on a plateau 849 feet above the sea-level, is intersected by both rivers, which are spanned by eight bridges, and is 54 square miles in area. The business portion lies near the rivers and the residences are on the higher grounds beyond.

Industries.—The city is located in the heart of a rich coal mining district, the mines in the vicinity employing over 2,000 persons, and having an annual output of 600,000 short tons. The principal industries, besides coal mining, include pork packing, and the manufacture of starch, structural iron, liquors, brick, and tile, foundry and machine shop products, brass goods, carriages and wagons, furniture, typewriters, cotton and woolen goods, and wall paper. It is also noted for its immense insurance interests, there being in the city 25 insurance companies. The Federal census of 1900 shows for all industries 494 establishments; capital, $7,911,764; 4,557 wage-earners; wages, $1,942,509; value of product, $10,488,189.

Banks and Publications.—There are 16 banks in the city, with a combined capital of $2,000,000, and deposits on 1 April 1905 of $21,835,966. There are published in the city three daily newspapers, four weekly newspapers, and 47 other periodicals.

Public Buildings, Churches, Educational Institutions, etc.—Among the most imposing structures in the city are the new State capitol, erected at a cost of $3,000,000; the Soldiers' Monument, costing $150,000, erected on the site of the old state house; the State Historical building, for the collection and preservation of historical records, specimens of art, science, and taxidermy, frontage 260 feet, depth 90 feet, height 60 feet, cost $500,000; the county court-house; the United States government building, containing the post-office and Federal courts; the State arsenal; the city library, containing over 50,000 volumes; two large hospitals, and the city-hall. There are several small libraries, five large opera houses, and 28 hotels. There are 91 churches in the city divided among the following denominations: Baptist, 9; Christian, 12; Congregational, 4; Protestant Episcopal, 2; Evangelical, 6; Friends, 1; Hebrew, 4; Latter-Day Saints, 1; Lutheran, 10; Methodist Episcopal, 19; Methodist Protestant, 3; Mormon, 1; Presbyterian, 7; Roman Catholic, 5; United Brethren, 4; Unitarian, 2; and Scientist, 1; and there are also 8 church missions. Church population, 20,478. The education of the young is provided for by 47 public schools and several high schools; for higher and technical education there are Drake University (Christian), founded in 1881; Des Moines College (Baptist) (q.v.), founded in 1865; Danish Lutheran College; Highland Park Normal College (Presbyterian); Iowa College of Medicine and Surgery; one college of osteopathy, and 7 technical schools. A military post for cavalry and artillery was established here by Congress, the land and buildings costing $200,000.

Public Works.—The city has 19 public parks covering in all 600 acres of land, and the Iowa State Fair Grounds, 600 acres in extent, are also permanently located there. The streets are well laid out and paved, there being 77 miles of brick and asphalt pavement; the city is lighted by gas and electric light, the gas distributed by 100 miles of mains, and the electric current carried over 110 miles of wire; the sewage and water systems are excellent, the waste being carried off by 93 miles of brick and pipe sewers, and the water conveyed to all parts of the city through 110 miles of mains by the Holly system for general use and fire protection.

History, Government, and Population.—Des Moines was first settled in 1846 by emigrants from Ohio, Indiana, Kentucky, and Missouri. In 1851 it was incorporated as the town of Fort Des Moines and in 1857 received its charter as the city of Des Moines. In 1856 it became the capital of the State by act of the legislature. The present form of government (1905) is under the general incorporation laws of the

State and council of nine members elected annually and representing the seven wards into which the city is divided. There are also police, fire, educational, and other city departments. The annual income of the city is about $1,100,000, and the budget of expenditures reports to $800,000, the principal items being $420,110.17 for schools, $98,000 for the fire department, $65,000 for street lighting, and $35,000 for the police department. The city debt in 1905, exclusive of school debt, was $727,777; property valuation $62,000,000, and tax rate $18.75 per $1,000 in West Des Moines and $22.00 per $1,000 in East Des Moines, the difference being due to the fact that the two sections are in different school districts. Compared with other cities of the United States, it ranks as follows: Clearing house reports, 52; banking, 25; post-office receipts, 31; population, 59. The predominating nationalities are American, German, Irish, Italian, and colored, in the order given. Pop. (1850) 502; (1870) 12,035; (1890) 50,093; (1900) 62,139; (1905) 75,428.

L. F. Andrews.

Des Moines College, a coeducational institution at Des Moines, Iowa, was organized in 1865 under the name University of Des Moines. This name was afterward changed to Des Moines College in order to conform more nearly to the aim of its supporters, the Baptists of Iowa. Like most schools of the kind, it has passed through severe financial struggles and reverses. It is now entirely free from debt, with an invested endowment of about $80,000 and pledges sufficient to increase this sum to $100,000. It also has a beautiful campus comprising two blocks upon which are two substantial brick buildings. An additional block adjoining is set apart as an athletic field, the whole comprising about nine acres and valued, with the buildings, at $90,000. The school has four departments: college, academy, music, and art. The college has steadily maintained as its aim a high class of work, and has taken rank with the best of Iowa colleges. It has 22 instructors. It was the first college to become affiliated with the University of Chicago. Under this arrangement the work of the school is constantly subject to the approval of the University. Professors and instructors have ample opportunity to carry on their own studies, either in attendance at the University or by correspondence.

J. P. Stephenson.

Des Moines River, the largest river in Iowa: formed by the east and west forks in southwest Minnesota; flows south-southeast to the capital city, then southeast to a point about four miles below Keokuk, where it empties into the Mississippi River; estimated length, 500 miles. It drains 10,000 square miles in Iowa; flows through a region rich in agricultural and grazing grounds, bituminous coal, and timber; receives the water of Raccoon, North, Middle, South, and Boone rivers. In its lower course it falls rapidly and affords abundant water power for manufacturing.

Desmoulins, Benoît, Camille, bĕ-nwä kā-mĕl dā-moo-lăn, French revolutionist: b. Guise, Picardy, 2 March 1760; d. Paris 5 April 1794. From the commencement of the Revolution he was connected with Robespierre, with whom he had studied at college. His friendship for Danton was the cause of his fall. Robespierre, at the head of the committee of Public Safety, was making rapid progress toward tyranny. Danton, assisted by the leaders of the Cordeliers, intended to resist this committee, and Camille commenced the attack in his journal, 'Le Vieux Cordelier,' in which he declared himself against the terrorists. With Danton he was arrested on 30 March 1794. On 2 April he was condemned, and on the 5th executed.

De Sola, Abraham, Canadian rabbi: b. London, England, 18 Sept. 1825; d. New York 5 June 1882. Under the careful supervision of his father he received a thorough Hebrew education, and having perfected himself in his general studies, he was called in 1847 to Montreal, Canada, by its Portuguese-Hebrew congregation. His scholarship and energy soon brought him to the front, and in 1848 he was appointed professor of Hebrew and Semitic literature in McGill College, Montreal. His literary labors consisted partly of contributions to the 'Occident' of Philadelphia and 'The Jewish Messenger' of New York, on historical and rabbinical themes, and partly of a revision of the Portuguese-Hebrew liturgy. On 9 Jan. 1872 he opened the House of Representatives of Washington with prayer, the first foreign clergyman to have received the privilege. Among his more important works may be mentioned: 'The Sanatory Institutions of the Hebrews'; 'Lectures on the Mosaic Cosmogony'; and 'Scripture Zoology.' He was for many years president of the Natural History Society of Montreal.

Desola'tion Land, or **Desolation Island,** an island belonging to Chile, in the archipelago of Tierra del Fuego. It is 70 miles long and about 15 miles in breadth. The name Desolation Island is also sometimes applied to Kerguelen Land (q.v.) in the Indian Ocean.

De Soto, dā sō'tō, **Bernardo,** Costa Rican statesman: b. 1854. He was elected president of the republic in 1887. During his administration the finances of the country, disordered by Guardia, were placed on a secure footing, and the work of completing the interoceanic railway from Port Limon, on the Caribbean Sea, to San José, the capital, and thence to Punta Arenas, on the Pacific coast, was prosecuted. Under him the long-dreamed-of unification of the central American republics became an accomplished fact.

De Soto, Hernando, ār-năn'dō, Spanish nobleman, conqueror, and explorer: b. Villanueva de la Serena (Badajoz) about 1496; d. 1542 or 1543. The date of his birth can not be ascertained precisely, some authorities placing it as late as 1500. But that which is here given is more likely to be correct, especially because we find him bearing a conspicuous part in central American expeditions between the years 1516–20. We can not easily assume that he was less than 20 in 1516. As a captain in 1523–4 he shared the adventures of Córdoba's fleet on the Nicaraguan coasts, and was overcome by Gil Gonzalez Dávila (q.v.) through treachery. Joining Francisco Pizarro in Panama with two ships, 60 men, and 10 horses, to take part in the conquest of Peru, he was appointed second in command. In 1532 he was the first Spaniard who spoke with Atahualpa; going to visit the unfortunate Inca in the character of an ambas-

sador, he continued to be well disposed toward him during his captivity. He returned to Spain in 1536, where he married in Madrid, the following year, Inés de Bobadilla, daughter of Pedrarias Davila (q.v.). Wholly misled by the first reports of the wealth of Florida, De Soto resolved to undertake the conquest of that country, which was represented to be as rich as Peru. He sold his property, and devoted the proceeds to the equipment of his ships and the outfit of his men, Charles I. bestowing upon him readily enough the title of governor of Florida and Cuba. At Sanlúcar he collected 950 fighting men, besides the sailors. Seven large ships and three small ones formed the fleet, his wife and family accompanying him in the San Cristóbal. Sailing from Sanlúcar 6 April 1538, he reached Santiago de Cuba safely, and there entered upon his duties as governor of the island; but transferred his authority at that point to his wife before proceeding to Havana (August 1538). By his orders Havana harbor was fortified (see CUBA). During the stay in Cuba his command was strengthened; 1,000 well-armed men were finally ready, and this was probably the best force which up to that time had undertaken the conquest of any part of America. The fleet sailed from Havana 12 May 1539. In Florida the Spaniards were moderately successful until they reached the province of Tascaluza, where a great host of natives attacked them. It was said that in this nine hours' fight 11,000 Indians fell, while on the Spanish side 70 were killed and nearly all (including De Soto himself) were wounded. Worn out by the long marches, which did not lead to the discovery of treasure, the soldiers plotted to abandon the enterprise. On learning of this, De Soto marched his men toward the interior, hoping to reach New Spain (Mexico) by land, and knowing that, at any rate, his followers would not care to desert him when the ships had been left far behind. In a nocturnal battle (December 1540) the Spaniards were again severely treated. Four months later they came upon a fort surrounded with a stockade, in storming which many were killed, and nearly all wounded. De Soto still led them forward, through the present Gulf States, and probably as far north as Kentucky, until he contracted a fever and died — according to Garcilaso, in 1542, though Herrera says 1543. The Spanish soldiers, who had thought to leave their commander in the lurch, were in this manner finally separated from him. At first they buried him in a trench the natives had opened near a village on the bank of a great river he had discovered; but several days afterward — either fearing the hostiles would dishonor the body, or suddenly realizing how they themselves might best honor it — they hollowed out the trunk of an evergreen oak, weighted the rude coffin with armor, placed the disinterred body within it, and sunk it by night in the deepest part of the river, which they called the Grande and we call the Mississippi.

MARRION WILCOX.

De Soto, dẹ sō'tō, Mo., a mining city in Jefferson County, on the St. Louis, Iron Mountain & Southern Railroad, about 40 miles south by west of St. Louis, and 15 miles west of the Mississippi River. In addition to its mining interests of zinc and lead, it has a large trade in agricultural products. Its industries include a flouring-mill, and the repair shops of the railroad. Pop (1900) 5,611.

Desoxybenzoin, phenyl-benzyl-ketone, $C_6H_5.CO.CH_2.C_6H_5$; obtained by the action of zinc and hydrochloric acid on chlorobenzil $C_6H_5.CO.CHCl.C_6H_5$, or by heating monobrom-stilbene with water to 180°. It crystallizes out of alcohol in large tables which melt at 55°. Desoxybenzoin can also be obtained by reducing benzoin $C_6H_5.CO.CH(OH).C_6H_5$.

Despard, dẽs'pärd, **Edward Marcus**, Irish soldier: d. London 21 March 1803. He was superintendent of the English colony in Honduras. In consequence of complaints made against him he was recalled in 1790. This made him disaffected, and he matured a plan to assassinate the king on his way to open Parliament. The conspirators were arrested and tried by special commission at Southwark 5 Feb. 1803. There being no doubt of their guilt, Despard and nine of his associates suffered death.

Despenser, dẽ-spẽn'sẽr, Hugh le, English courtier: b. about 1262; d. 27 Oct. 1326. He distinguished himself as a soldier and diplomat in the service of Edward II. and became Earl of Winchester in 1322. His tyranny as the royal favorite led to a revolt of the barons and his own downfall.

Despenser, Hugh le, English courtier, son of the preceding: b. about 1290; d. November 1326. He deserted the baronial party for that of Edward II., and became a royal favorite. He and his father were involved in the misfortunes following the flight of King Edward from London, and were beheaded in the same year.

Despériers, Bonaventure, bō-nä-vän-toor dā-pā-rē-a, French writer: b. Arnay-le-Duc about 1505; d. 1544. He was secretary to Margaret of Navarre. He wrote a series of 90 stories: 'New Recreations and Merry Conceits,' printed in 1558. In 1537 was published his 'Cymbalum Mundi' in French, a virulent attack on the Christian religion, which was burned by the common hangman, and of which only one copy is in existence.

Des Plaines (dẽ plān) **River** (named from a species of maple called by the French *plaine*). A river of Illinois which rises in the southeastern part of Wisconsin and flows south and southwest until it unites with the Kankakee River at Dresden, Ill., to form the Illinois River. In length the Des Plaines is about 150 miles. For some distance the river flows almost parallel with the shore line of Lake Michigan. For several miles the waters of the Des Plaines have been made to contribute to the Chicago Drainage Canal (q.v.)

Despoblado, dāz-pō-blä'dō (desert), a name given in South America to any barren tracts in the Andes, which are so high and cold as to be uninhabitable. It is given as a specific name to (1) a treeless, uninhabited plateau, nearly 10,000 feet above the sea, on the Bolivian and Argentine frontier; and (2) a region in Peru between the central and western Cordilleras, ranging from 14,000 to 18,000 feet above the sea-level.

Despot (from the Greek *despotēs*), originally a master, a lord; at a later period it became an honorary title which the Greek emperors gave to their sons and sons-in-law when governors of provinces. Alexis III., surnamed Angelus,

toward the end of the 12th century, is said to have first introduced this title, and to have made it the first in rank after that of emperor. Thus there was a despot of the Morea, of Servia, etc. At present, despot means an absolute ruler, as the emperor of Russia; but, in a narrower sense, it conveys the idea of tyranny, as in fact the possession of absolute power and the abuse of it are two things bordering very closely on each other.

Despoto Dagh, dĕs pō tō dăh, a mountain chain of European Turkey, extending from 30 miles to the east of the Balkans to the bank of the Maritza.

Dessaix, Joseph Marie, zhō-zĕf mā-rē dā-sā, French general: b. Thonon, Savoy, 24 Sept. 1764; d. 26 Oct. 1834. He served at the siege of Toulon, and in Italy under Bonaparte; was elected in 1798 to the council of 500, where he opposed the *coup d'état* of the 18th Brumaire. He was made a brigadier-general by Bonaparte in 1803, and, in the campaign of 1809 against Austria, a general of division, receiving from the emperor the surname of *L'intrepide*, and the title of count of the empire.

Dessalines, Jean Jacques, zhŏń zhāk dā-sà-lēn, emperor of Haiti: b. 1760; d. 14 Oct. 1806. He took the name of the person in whose service he remained until 1790; after that time he fought under Biasson, and, still later, joined Toussaint L'Ouverture. In his struggle against Gen. Rigaud he signalized himself as much by his cruelty as his bravery. In 1802 he surrendered to Gen. Leclerc. But when an epidemic of yellow fever fell upon the French army and almost annihilated it, he attacked Rochambeau with an army of 30,000 blacks, thus obliging the French commander to surrender to the English, and to leave the island (1803). In 1804, when governor-general of Haiti, he issued an order for the general slaughter of the white inhabitants. In October of the same year he was proclaimed emperor, and made an unsuccessful attempt to take the city of Santo Domingo in March 1805. Incurring the enmity of his own followers, he was killed in an ambuscade near Port au Prince.

Dessau, dĕs'sow, Germany, capital of the duchy of Anhalt, in a valley on the Mulde, on the railroad between Berlin, Köthen, and Leipsic. The principal building is the ducal palace, built in 1748, containing both a picture-gallery and a library, in which are numerous MSS. of Luther. The manufactures consist of woolen and linen cloth, hats, leather, tobacco, musical and other instruments. The ground around Dessau, originally a sandy waste, has been completely reclaimed, and is now covered with beautiful gardens. Pop. 42,375.

Dessicants, in medicine, substances that check secretions from mucous membranes or cause cicatrization. See ASTRINGENTS.

Desterro, dăs-tār'rō, also called officially **Florianopolis,** Brazil, the capital of the state of Santa Catharina. It is situated on a long and narrow island near the mainland, and its foreign trade passes through the port of São Francisco, which is one of the best on the coast of southern Brazil. During the revolt of the navy in 1893, the most critical period through which the new Brazilian institutions have passed, Desterro and its port were headquarters of the rebellion. Pop. (1903) estimated 15,000.

Destouches, Philippe Néricault, fē-lēp nā-rē-kō, French dramatist: b. Tours, France, 22 Aug. 1680; d. near Melun, France, 4 July 1754. His comedy, 'The Boaster' (1732), is a masterpiece in matter, in elaboration, and in character delineation; Lessing classes that work, with its companion piece, 'The Spendthrift' (1736), as "models of the finer high comedy." Hardly inferior to these is 'The Married Philosopher' (1727), largely based on the author's own life.

Destroying Angels. See DANITES.

Destutt de Tracy, Antoine Louis Claude, ăñ-twan loo ē klōd dā-stüt dė tra-sē, COUNT, French philosophical and metaphysical writer: b. Paris 20 July 1754; d. there 10 March 1836. Though in repeated peril during the French Revolution, he survived to write 'Elements of Ideology' (1817), a development of Condillac's philosophy, and in part an exposition of what then passed for economics. His 'Delineations of the Politics of the World's Nations' (1820), and prior works, received considerable notice in the United States through Jefferson, who translated the 'Commentaire sur l'Esprit des Lois' (1806) into English and had it published in Philadelphia (1811).

Desulto'res (from *desilio*, "I vault"), the Latin name for vaulters or leapers, who jumped from one horse to another. The Scythian, Indian, and Numidian cavalry were very expert desultores, and each man carried at least two horses to the field. When one was weary he jumped with great agility upon another, which he led by his hand. The Greeks and Romans introduced the same practice in their games, races, and funeral solemnities, but never, as far as we know, in war. Homer describes a vaulter of this sort who performed his feats on four horses at once (Iliad, xv. 679); and Livy (xxiii. 29) describes a kind of Numidian cavalry in Hasdrubal's army in Spain, in which the soldiers had two horses each, and in the heat of an engagement frequently leaped, fully armed, from one to another. Ælian gives a similar account of a tribe dwelling not far from the Danube, who, on this account, were called *Amphippi*.

Detachment, a body of troops or part of a fleet selected from the main body for some special service.

Detaille, Jean Baptiste Edouard, zhŏń bāp-tēst ĕd-oo-ard, dė-ta-yė, French painter: b. Paris 5 Oct. 1848. He is distinguished for his treatment of battles and military subjects. One of his best pictures, 'The Passing Regiment,' is in the Corcoran Art Gallery in Washington, D. C.

Detective, one who searches for criminals or ferrets out crime. The work of the detective is allied to that of the police, and wherever a police force exists there is some detective work to be done, though only in connection with a large police force are men regularly assigned to detective work. The police force of New York includes a body of men known as detective sergeants, who have charge of the work of looking for criminals or investigating such crimes as seem to call for their services. The United States government maintains a force,

known as Secret Service men, whose principal duties consist in unearthing counterfeiters, and those who rob the mails or infringe the revenue laws. The British government has established in London a force of detectives known as Scotland Yard men.

There are private detective establishments in all large cities, the best-known of these being the Pinkerton bureau, which has offices in several cities of the United States under the style of the Pinkerton National Detective Agency. This agency and similar bureaus make a business of supplying detectives to any one who will pay for the work, usually to get evidence in civil or criminal suits.

The detective achieves success by studying the ways of lawbreakers, and becoming acquainted with the haunts of the men he seeks. For instance, William Pinkerton, of Chicago, made an exhaustive study of the class of tramps who rob country stores and post-offices, and blow off the doors of safes. Their own name for their class is "yeggmen," and the only way to know them thoroughly is to become one of them for a time, to live as they do, and thus secure their confidence, and gain familiarity with their system of exchanging information. These yeggmen had a habit of registering on the tank houses of railway stations, where they would write the names by which they were known, with the date, and the direction they were going. Doubtless this practice has changed for some other, since the detectives became familiar with it, and used their knowledge to lodge various bad characters behind the bars.

Those detectives who achieve the best results make a specialty of one line of work, with which they become perfectly familiar. In a city like New York there is on the detective force at least one man familiar with the ways of each of the principal class of crooks. If a pickpocket is wanted, the man familiar with that work is supposed to have a pretty good idea what pickpockets are in town, and where they can be located; if he be an extra good detective, he will also be able to form a judgment from the nature of a steal, who are most likely to have been the thieves. It is this sort of knowledge that makes possible the quick detection of criminals.

The nature of detective work is such that very little authoritative matter has been printed about it. One of the first requisites of a detective is the power of keeping silence about the business or the cases on which he works. There are no printed reports and statistics of detective work that could be used in an encyclopædia. Most of the literature is of the nature of detective stories, told to amuse, and concealing instead of making clear real occurrences or facts. The detective at work is really a very different man from what he is pictured in the novel. He has usually had police experience, and is big and strong. These things, with a knowledge of the class of men he is to seek, are his stock in trade. One of the most common and difficult jobs that falls to his lot is the simple following of a man, whom he has located, but whom he does not wish to arrest, until he has traced him to his living place or some haunt where he can also expect to locate some companion or accomplice. To follow a man in an ordinary way is to invite him to escape, for if a crook in a city street suspects he is followed, he is almost certain to elude the pursuer. The detective who follows one must not stop whenever his man stops, but go right on and appear to pay no attention to him. He must know enough to jump on a car to get ahead of his man, and to be out of view; to dodge through a shortcut if there be one where he cannot lose his man, or to do any one of a dozen things promptly to serve his purpose. It is dangerous to take his eyes off the crook, and equally dangerous to let the crook have a good look at his shadower, so that if the following has to be kept up for any considerable distance it is a very trying piece of work.

The private detective has fallen into some disrepute in the United States, owing to employment on divorce cases or other matters where there is a temptation to manufacture evidence instead of finding it. Some judges have refused to credit the testimony of such detectives unless corroborated. In many cities private detectives are obliged to take out a license before they are allowed to follow the calling.

The Secret Service men whose duty it is to protect the mails have a simple method of locating thieves. Whenever a letter is lost, and a tracer sent after it, and the man found who last had knowledge of the letter, a pin is stuck in a map at the city where the letter was last seen. As more lost letters are searched for, the pins in this map begin to show central points where letters disappear with regularity. This shows about where there is regular thieving, and a detective has his field of work clearly pointed out to him, and by watching the men who handle the mail in that district he is usually sure of locating his man before very long. See also POLICE; SECRET SERVICE.

Determinants, an important class of algebraic functions which owe their origin to the attempt to formulate the solutions of general systems of simultaneous linear equations. Such a system of the second order is

$$a_1x+b_1y=\kappa_1, \quad a_2x+b_2y=\kappa_2;$$

from which

$$x=\frac{\kappa_1b_2-\kappa_2b_1}{a_1b_2-a_2b_1}, \qquad y=\frac{a_1\kappa_2-a_2\kappa_1}{a_1b_2-a_2b_1}.$$

The solution of the system of the third order,

$$a_ix+b_iy+c_iz=\kappa_i, \qquad (i=1, 2, 3),$$

in like manner gives

$$x=\frac{\kappa_1b_2c_3+\kappa_2b_3c_1+\kappa_3b_1c_2-\kappa_3b_2c_1-\kappa_1b_3c_2-\kappa_2b_1c_3}{a_1b_2c_3+a_2b_3c_1+a_3b_1c_2-a_3b_2c_1-a_1b_3c_2-a_2b_1c_3},$$

with expressions of similar form for y and z.

The functions appearing in the numerators and denominators of the expressions for the unknowns in the above, and in similar systems of equations, are determinants. They are formed in accordance with a general principle, the first precise statement of which was based upon the recognition of the two classes of permutations, as will presently be explained.

2. It is shown in algebra (*q.v.*) that the number of permutations of n elements arranged non-cyclically is $n(n-1)\ldots 2\cdot 1\equiv n!$. Any two elements, whether adjacent or not, standing in their natural order in a permutation constitute a permanence; standing in an order the reverse of the natural, an inversion. Thus, in the per-

permutations of a and b the permanences are ba, ac, ab; the inversions are ab, ba, bc, ac, cb, ca.

In permutations of any set of elements are classified, as to class, in two categories, viz., the positive, in which the number of inversions is even, and the negative, in which the number is odd. When the elements are arranged in the natural order the number of inversions is zero, which is even.

3. Interchanging two adjacent elements, a and a', of a permutation changes its class. For, if aa' is a permanence, $a'a$ is an inversion and *vice versa*, and the interchange either introduces or destroys an inversion. When the two elements interchanged are non-adjacent let the number of elements between them be q and represent these, in the aggregate, by Q. As in the preceding case the interchange has no effect upon the relation of a and a' to the elements preceding or following aQa'. The arrangement Qaa' may now be obtained by interchanging a with each of the q elements of Q in turn, after which a' may be moved to the first place by successive interchanges with the $q+1$ elements of Qa. Hence, the total number of interchanges of adjacent elements involved in the transition from the order aQa' to the order $a'Qa$ is $2q+1$, an odd number, from which follows the important theorem: The interchange of any two elements of a permutation changes its class.

Of any complete set of permutations one half are positive and one half negative.

4. Assume n^2 elements arranged in a square array thus:

$$\begin{vmatrix} a_1'a_1'' & \dots & a_1^{(n)} \\ a_2'a_2'' & \dots & a_2^{(n)} \\ \dots\dots\dots & & \\ a_n'a_n'' & \dots & a_n^{(n)} \end{vmatrix}$$

In this array the position of any element is shown by its indices. For example, a_5''' is in the third column and the fifth row. The diagonal through a_1', a_2'', $\dots$ $a_n^{(n)}$ is called the principal diagonal; that through a_n', a_{n-1}'', $\dots$ $a_1^{(n)}$ the secondary diagonal; the position occupied by a_1' the leading position.

The above array, inclosed by vertical bars as shown, is used to represent the determinant of its n^2 elements. This function may now be defined.

Write down the product of the n elements on the principal diagonal, arranging them in the natural order, thus: $a_1'a_2''a_3''' \dots a_n^{(n)}$. This is the principal term of the determinant. Now permute the subscripts of the principal term in every possible way, leaving the superscripts undisturbed. To such of the $n!$ resulting terms as involve the positive permutations of the subscripts give the plus sign; to those involving the negative permutations, the minus sign. The algebraic sum of all the terms thus obtained is the determinant represented by the given array.

Applying the process to the determinant array of the second order, there results

$$\begin{vmatrix} a_1'a_1'' & a_1'a_2'' \\ a_2'a_2'' & a_2'a_1'' \end{vmatrix};$$

while that of the third order gives

$$\begin{vmatrix} a_1'a_1''a_1''' \\ a_2'a_2''a_2''' \\ a_3'a_3''a_3''' \end{vmatrix} = a_1'a_2''a_3''' - a_1'a_3''a_2''' + a_2'a_3''a_1''' - a_2'a_1''a_3''' + a_3'a_1''a_2'' - a_3'a_2''a_1'''.$$

Each term of a determinant thus contains a single element from each column and each row of its array and is, therefore, a homogeneous function of its elements.

5. The expansion of the array of the second order may be written out at a glance. The process is less obvious, but still simple, for the array of the third order. It is as follows, the columns being, in this instance, ranked alphabetically instead of by indices: Beneath the square array write the first and second rows as shown in the figure. Then form the six products, each of three elements, traversed by one of the six oblique lines, applying the signs as indicated. The aggregate of terms thus obtained is the required expansion, as may readily be verified.

The reader will now do well to note how the values of the systems of unknowns x, y, and r, y, z, obtained at the outset, may be written in the notation of determinants.

No such direct methods as the above are available for the expansion of determinant arrays of higher orders, but these will be considered further on. See 13.

6. In writing determinants it is often convenient to use a double-subscript notation, the first subscript designating the row and the second the column to which the element belongs. Thus the element a_{35} stands in the third row and the fifth column. When the elements are merely symbolic it is customary to write only the principal term between the vertical bars. In this, which is called the umbral notation, the determinant of the nth order is

$$|a_1'a_2'' \dots a_n^{(n)}| \quad \text{or} \quad |a_{11}a_{22} \dots a_{nn}|;$$

which are often further abridged to $|a_1^{(n)}|$ and $|a_{1,n}|$ respectively.

Thus far the economy of the notation of determinants is scarcely apparent. Specific forms of higher order have, however, been purposely avoided. It is only necessary to write out the expansion of an array of the fourth order, which includes $4! = 24$ terms each of the fourth degree, to understand the necessity of a general theory of such forms. Determinants of even the fifth and sixth orders would be, if written out in full, quite beyond manipulation; while the complete expansion of

$$|a_1'a_2''a_3'''a_4^{\text{IV}}a_5^{\text{V}}a_6^{\text{VI}}a_7^{\text{VII}}a_8^{\text{VIII}}a_9^{\text{IX}}a_{10}^{\text{X}}a_{11}^{\text{XI}}a_{12}^{\text{XII}}|,$$

and such functions are not at all uncommon, would fill over a thousand closely printed volumes like the present! Yet, by means of the theory of determinants, such expressions are not only intelligible but manageable. The general properties of determinants will now be considered.

7. Any term of the development of $|a_1^{(n)}|$ may be written

$$\pm a_h'a_i''a_j''' \dots a_l^{(n)}. \qquad (a)$$

Designate by u the number of inversions in the permutation $hij \dots l$ and by v the number of interchanges of two elements necessary to bring the given term into the form

$$\pm a_1^{(p)}a_2^{(q)}a_3^{(r)} \dots a_n^{(t)}. \qquad (b)$$

Obviously u and v are either both even or both odd; but the permutation $pqr \dots t$ is positive or negative, according as v is even or odd, and the term will, therefore, have the same sign

whether it be determined by the permutation of the subscripts of (a) or by that of the superscripts of (b). It follows that the development of a determinant may be obtained by permuting the superscripts and writing the signs of the terms in accordance with these permutations, instead of using the subscripts as already explained. Passing from one of these methods of development to the other is equivalent to changing each column of the array into a row of the same rank and *vice versa*. Hence, a determinant is not altered by changing the rows into corresponding columns and the columns into corresponding rows. Any statement made with reference to the rows of a determinant must, therefore, be equally true with respect to the columns. Rows and columns are alike called lines.

8. If any two parallel lines of a determinant be interchanged the determinant will be changed only in sign. For, interchanging two lines is the same as interchanging, in each term of the expansion, the indices corresponding to these lines. This reverses the sign of each term and therefore that of the whole determinant.

The element $a_\kappa^{(s)}$ may be transferred to the leading position by interchanging the κth row with the $(\kappa-1)$ preceding rows and the sth column with the $(s-1)$ preceding columns. This being done, the resulting determinant must take the sign factor $(-1)^{\kappa+s}$.

A determinant having two parallel lines identical is equal to zero; for the interchange of these identical lines reverses the sign without altering the value of the function.

9. A determinant having a line of elements each the sum of two or more quantities can be expressed as a sum of two or more determinants. Let

$$\Delta \equiv \begin{vmatrix} a_1(b_1+b_1'-b_1''\pm\dots)c_1\dots \\ a_2(b_2+b_2'-b_2''\pm\dots)c_2\dots \\ a_3(b_3+b_3'-b_3''\pm\dots)c_3\dots \\ \dots\dots\dots\dots \end{vmatrix}$$

be such a determinant. Then, writing

$$B_i \equiv b_i+b_i'-b_i''\pm\dots,$$

any term of the development of Δ is of the form

$$\pm a_pB_qc_r\dots = \pm a_pb_qc_r\dots \pm a_pb_q'c_r\dots \mp a_pb_q''c_r\dots\pm\dots$$

The terms of Δ are obtained by permuting the subscripts $p, q, r, \dots$ of $a_pB_qc_r\dots$. Permuting simultaneously the same subscripts in the second member and giving to each term thus obtained its appropriate sign, there results

$$|a_1B_2c_3\dots| = |a_1b_2c_3\dots| + |a_1b_2'c_3\dots| - |a_1b_2''c_3\dots| \pm \dots,$$

which proves the theorem.

10. Multiplying each element of a given line of a determinant by a given factor multiplies the determinant by that factor; for each term of the expansion contains a single element from the given line. The common factor thus appears once and only once in each term of the expansion, and the determinant is, therefore, multiplied by that factor.

In the same way it may be shown that a determinant having a line of zeros is equal to zero. It also follows that if the elements of any line have a common ratio to the corresponding elements of any parallel line the determinant vanishes.

11. If each element of a line of a determinant be multiplied by a given factor and the product added to the corresponding element of any parallel line the value of the determinant will not be changed. This follows directly from 9 and 10. Thus

$$\begin{vmatrix} a_{11}a_{12}a_{13}\dots a_{1n} \\ \dots\dots\dots \\ a_{n1}a_{n2}a_{n3}\dots a_{nn} \end{vmatrix} = \begin{vmatrix} a_{11}a_{12}(a_{13}+ma_{11})\dots a_{1n} \\ \dots\dots\dots\dots\dots \\ a_{n1}a_{n2}(a_{n3}+ma_{n1})\dots a_{nn} \end{vmatrix}$$

12. The terms of $|a_1^{(n)}|$ which contain the element a_1' are those found in the expansion of

$$\begin{vmatrix} a_1' & 0 & 0 & \dots & 0 \\ a_2'a_2''a_2''' & & & \dots & a_2^{(n)} \\ \dots & & & \dots & \dots \\ a_n'a_n''a_n''' & & & \dots & a_n^{(n)} \end{vmatrix}. \qquad (a)$$

For if, in forming any term, another element than a_1' be taken from the first column an element zero must be taken from the first row, and the term vanishes. It may readily be shown that the determinant (a) is equal to

$$a_1' \begin{vmatrix} a_2''a_2''' & \dots & a_2^{(n)} \\ \dots & \dots & \dots \\ a_n''a_n''' & \dots & a_n^{(n)} \end{vmatrix}, \qquad (b)$$

which is therefore the aggregate of the terms of $|a_1^{(n)}|$, $(n-1)!$ in number, which contain the element a_1'.

The determinant factor of order $(n-1)$ by which the element a_1' is multiplied in (b) is called the co-factor of that element in $|a_1^{(n)}|$. It may be obtained from the given determinant by deleting the first column and the first row.

The co-factor of any element $a_\kappa^{(s)}$ may be found in the same manner after transposing this element to the leading position. But this transposition multiplies the determinant by the sign factor $(-1)^{\kappa+s}$. Hence, to find the co-factor of $a_\kappa^{(s)}$, delete its row and its column and give the resultant determinant the

$$\begin{pmatrix}\text{positive}\\\text{negative}\end{pmatrix} \text{sign when } (\kappa+s) \text{ is } \begin{pmatrix}\text{even}\\\text{odd}\end{pmatrix}.$$

The co-factor thus obtained is represented by $A_\kappa^{(s)}$, the sign factor $(-1)^{\kappa+s}$ being intrinsic. For example, the co-factors of the elements of the second row of $|a_1'a_2''a_3'''|$ are

$$A_2' \equiv -\begin{vmatrix} a_1''a_1''' \\ a_3''a_3''' \end{vmatrix}, \quad A_2'' \equiv \begin{vmatrix} a_1'a_1''' \\ a_3'a_3''' \end{vmatrix}, \quad A_2''' \equiv -\begin{vmatrix} a_1'a_1'' \\ a_3'a_3'' \end{vmatrix}.$$

13. The aggregates of terms containing the elements $a_\kappa', a_\kappa'', \dots a_\kappa^{(n)}$ of the determinant $|a_1^{(n)}|$ are, respectively,

$$a_\kappa'A_\kappa', \quad a_\kappa''A_\kappa'', \dots a_\kappa^{(n)}A_\kappa^{(n)}.$$

Each of these n aggregates includes $(n-1)!$ terms of $|a_1^{(n)}|$, no one of which appears in any of the others. In all of them, then, there are $n(n-1)!$ or $n!$ different terms of the determinant, which is the whole number. Hence

$$|a_1^{(n)}| = a_\kappa'A_\kappa' + a_\kappa''A_\kappa'' + \dots + a_\kappa^{(n)}A_\kappa^{(n)}. \qquad (1)$$

Similarly,

$$|a_1^{(n)}| = a_1^{(s)}A_1^{(s)} + a_2^{(s)}A_2^{(s)} + \dots + a_n^{(s)}A_n^{(s)} \qquad (2)$$

Any determinant may, by means of either (1) or (2), be resolved into determinants of an order one lower and thus, since $A_\kappa', \dots A_\kappa^{(n)}$ or

$A_1^{(s)} \ldots A_n^{(s)}$ are themselves determinants, it may ultimately be expressed in terms of determinants of the third or second order, which may readily be expanded (see 5).

14. If the hth and κth rows of $|a_1^{(n)}|$ are identical the elements a_h', a_h'', $\ldots a_h^{(n)}$ in formula (1) may be replaced by $a_h', a_h'', \ldots a_h^{(n)}$, respectively. But in this case the value of the determinant is zero. Hence, h and κ being different,

$$a_h' A_\kappa' + a_h'' A_\kappa'' + \ldots + a_h^{(n)} A_\kappa^{(n)} = 0. \qquad (3)$$

Likewise r and s being different,

$$a_1^{(r)} A_1^{(s)} + a_2^{(r)} A_2^{(s)} + \ldots + a_n^{(r)} A_n^{(s)} = 0. \qquad (4)$$

15. The determinant of order $(n-1)$ obtained by deleting the κth row and the sth column of $\Delta = |a_1^{(n)}|$ is called the minor of the determinant with respect to the element $a_\kappa^{(s)}$, and is written $\Delta_{(\kappa)}^{(s)}$. Obviously, by what precedes,

$$A_\kappa^{(s)} = (-1)^{\kappa+s} \cdot \Delta_{(\kappa)}^{(s)}.$$

If two rows, the hth and κth, and two columns, the rth and sth, are deleted the result is written $\Delta_{(h,\kappa)}^{(r,s)}$, and is called a minor of the second order. Minors of lower orders may be obtained in a similar manner and expressed by a similar notation.

Any mth minor of a given determinant and the determinant of the m^2 elements at the intersection of the rows and columns deleted in forming it are called, with respect to each other, complementary minors. The determinant may be expressed in terms of products of pairs of complementary minors, a method of expansion due to Laplace. Formulæ (1) and (2) are special cases of the method. Its general statement is somewhat complicated.

16. The principles thus far developed will now be applied to the solution of systems of simultaneous linear equations; the process which, as stated at the outset, led to the discovery and investigation of determinants. Assume the system of three equations

$$a_i x + b_i y + c_i z = \kappa_i \qquad (i = 1, 2, 3.)$$

In the determinant $|\kappa_1 b_2 c_3|$, let the elements κ_1, κ_2, κ_3 be replaced by the equal quantities appearing in the first members of the given equations. The two determinants now in hand are equal to each other; thus

$$\begin{vmatrix} a_1x + b_1y + c_1z & b_1 & c_1 \\ a_2x + b_2y + c_2z & b_2 & c_2 \\ a_3x + b_3y + c_3z & b_3 & c_3 \end{vmatrix} = \begin{vmatrix} \kappa_1 & b_1 & c_1 \\ \kappa_2 & b_2 & c_2 \\ \kappa_3 & b_3 & c_3 \end{vmatrix}.$$

But the first member of this equation may be separated into the determinants (see 9 and 10)

$$x|a_1b_2c_3|, \quad y|b_1b_2c_3|, \quad \text{and} \quad z|c_1b_2c_3|,$$

the second and third of which are, by 8, equal to zero. Hence

$$x|a_1b_2c_3| = |\kappa_1b_2c_3|;$$

or, explicitly (see 1),

$$x = \frac{\begin{vmatrix} \kappa_1 & b_1 & c_1 \\ \kappa_2 & b_2 & c_2 \\ \kappa_3 & b_3 & c_3 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}}.$$

Similarly, by starting with the determinants $|a_1\kappa_2c_3|$ and $|a_1b_2\kappa_3|$, respectively, the values of y and z are found to be

$$y = \frac{|a_1\kappa_2c_3|}{|a_1b_2c_3|}, \qquad z = \frac{|a_1b_2\kappa_3|}{|a_1b_2c_3|}.$$

It will be noted that the values of the unknowns have for a common denominator the determinant of the coefficients of the given equation; while the numerator is, in each case, obtained from the denominator by replacing the column of coefficients of the unknown in question by the column of absolute terms. The method is applicable to linear systems of any order.

17. When the number of given equations is greater than the number of unknowns their consistency obviously depends upon some definite relation among the known elements. Let

$$a_i x + b_i y = \kappa_i \qquad (i = 1, 2, 3)$$

be such a redundant system.

Solving the first two of these equations gives (see 1)

$$x = \frac{\begin{vmatrix} \kappa_1 & b_1 \\ \kappa_2 & b_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}, \qquad y = \frac{\begin{vmatrix} a_1 & \kappa_1 \\ a_2 & \kappa_2 \end{vmatrix}}{\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}}.$$

If, now, the three equations are consistent, these values must also satisfy

$$a_3 x + b_3 y = \kappa_3;$$

whence, substituting the above values and clearing of fractions,

$$a_3 \begin{vmatrix} \kappa_1 & b_1 \\ \kappa_2 & b_2 \end{vmatrix} + b_3 \begin{vmatrix} a_1 & \kappa_1 \\ a_2 & \kappa_2 \end{vmatrix} = \kappa_3 \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix};$$

or, by 8, and (1)

$$a_3 \begin{vmatrix} b_1 & \kappa_1 \\ b_2 & \kappa_2 \end{vmatrix} - b_3 \begin{vmatrix} a_1 & \kappa_1 \\ a_2 & \kappa_2 \end{vmatrix} + \kappa_3 \begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & \kappa_1 \\ a_2 & b_2 & \kappa_2 \\ a_3 & b_3 & \kappa_3 \end{vmatrix} = 0. \qquad (5)$$

The above process being generalized, it appears that the condition that n linear equations between $(n-1)$ unknowns constitute a consistent system is that the determinant of the coefficients and absolute terms be zero.

18. Consider now the homogeneous linear equations

$$a_i x + b_i y + c_i z = 0. \qquad (i = 1, 2, 3)$$

Solving these equations as in 16 gives

$$x = y = z = \frac{0}{|a_1b_2c_3|} = 0,$$

unless

$$|a_1b_2c_3| = 0; \qquad (6)$$

in which case each unknown becomes $\frac{0}{0}$, which may have any value whatever. But the given equations may be written

$$a_i \frac{x}{z} + b_i \frac{y}{z} + c_i = 0; \qquad (i = 1, 2, 3)$$

any two of which will determine the ratios $\frac{x}{z}$ and $\frac{y}{z}$. If these three equations form a con-

sistent system in $\frac{x}{z}$ and $\frac{y}{z}$, however, the condition expressed by (6) holds good (see 17); that is to say, the given equations consistently determine the ratios $x:y:z$ only when the determinant of the coefficients vanishes. In this case, as may readily be shown,

$$\begin{aligned} x:y:z:: & A_1:B_1:C_1 \\ :: & A_2:B_2:C_2 \\ :: & A_3:B_3:C_3. \end{aligned} \qquad (7)$$

When the determinant of the coefficients does not vanish the equations are satisfied only by the values $x=y=z=0$. In general:

The condition that n homogeneous linear equations between n unknowns form a consistent system, for other than zero values of the unknown, is that the determinant of the coefficients be zero.

The relation expressed by (7) may also be generalized thus: In any determinant which equals zero, the co-factors of the elements of any line are proportional to the co-factors of the corresponding elements of any parallel line.

The determinants (5) and (6) are called resultants or eliminants, each being the result of eliminating the unknowns from the system of equations from which it is derived.

19. Again let there be r homogeneous linear equations involving n unknowns, r being greater than n, thus:

$$a_i'x'+a_i''x''+\ldots+a_i^{(n)}x^{(n)}=0. \qquad (i=1, 2, \ldots n_1, \ldots r).$$

The consisteney of these equations requires that every determinant of the nth order, formed by selecting n rows from the array whose elements are the coefficients written in order, shall be zero. If these conditions are fulfilled the fact is expressed by writing

$$\left\| \begin{matrix} a_1'a_2' & \ldots a_n' & \ldots a_r' \\ a_1''a_2'' & \ldots a_n'' & \ldots a_r'' \\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot\ \cdot & & \\ a_1^{(n)}a_2^{(n)} & \ldots a_n^{(n)} & \ldots a_r^{(n)} \end{matrix} \right\| = 0;$$

the change of rows into columns being purely arbitrary. The above expression is called a rectangular array or a matrix.

20. Let it be required to eliminate the unknowns from the equations

$$ax^2+bxy+cy^2=0, \quad \alpha x+\beta y=0.$$

Multiplying the second equation, first by y and then by x, there become available three equations involving the three unknowns x^2, xy, y^2, as follows:

$$\begin{aligned} ax^2+bxy+cy^2 &= 0, \\ \alpha xy+\beta y^2 &= 0, \\ \alpha x^2+\beta xy &= 0. \end{aligned}$$

The eliminant of this system, if consistent, is

$$\begin{vmatrix} a & b & c \\ 0 & \alpha & \beta \\ \alpha & \beta & 0 \end{vmatrix} = 0.$$

If the given equations be inconsistent this determinant does not vanish.

This process, due to Sylvester, may readily be generalized. It is known as the dialytic method of elimination.

21. The product of two determinants may be most readily obtained as an eliminant. To this end let

$$a_{11}x_1+a_{12}x_2=0, \quad a_{21}x_1+a_{22}x_2=0 \qquad (a)$$

be linearly transformed by substituting

$$x_1=b_{11}w_1+b_{21}w_2, \quad x_2=b_{12}w_1+b_{22}w_2; \qquad (b)$$

the result being

$$\left.\begin{aligned} (a_{11}b_{11}+a_{12}b_{12})w_1+(a_{11}b_{21}+a_{12}b_{22})w_2 &= 0, \\ (a_{21}b_{11}+a_{22}b_{12})w_1+(a_{21}b_{21}+a_{22}b_{22})w_2 &= 0. \end{aligned}\right\} \qquad (c)$$

Now the condition that equations (c) be consistent is that the determinant

$$\begin{vmatrix} a_{11}b_{11}+a_{12}b_{12} & a_{11}b_{21}+a_{12}b_{22} \\ a_{21}b_{11}+a_{22}b_{12} & a_{21}b_{21}+a_{22}b_{22} \end{vmatrix} \qquad (d)$$

shall vanish. But they may be consistent because equations (a) are so, in which case

$$\begin{vmatrix} a_{11}a_{12} \\ a_{21}a_{22} \end{vmatrix} = 0; \qquad (e)$$

or, this condition failing, and (a) thus having no solution other than $x=0=y$, (c) will still be consistent if equations (b) are so; that is, if

$$\begin{vmatrix} b_{11}b_{12} \\ b_{21}b_{22} \end{vmatrix} = 0. \qquad (f)$$

The vanishing of either of the determinants (e) or (f), therefore, causes (d) to vanish; from which it follows that the determinants (e) and (f) are factors of (d). The only other factor is numerical and may readily be shown, by comparing coefficients, to be unity. Hence,

$$\begin{vmatrix} a_{11}a_{12} \\ a_{21}b_{22} \end{vmatrix} \cdot \begin{vmatrix} b_{11}b_{12} \\ b_{21}b_{22} \end{vmatrix} = \begin{vmatrix} a_{11}b_{11}+a_{12}b_{12} & a_{11}b_{21}+a_{12}b_{22} \\ a_{21}b_{11}+a_{22}b_{12} & a_{21}b_{21}+a_{22}b_{22} \end{vmatrix}.$$

The same method may be applied to the formation of the product of any two determinants of the same order. The operation may be described as follows:

To form the product $|p_{1n}|$ of two determinants $|a_{1n}|$ and $|b_{1n}|$, first connect by plus signs the elements of the rows of both $|a_{1n}|$ and $|b_{1n}|$. Then place the first row of $|a_{1n}|$ upon each row of $|b_{1n}|$ in turn and let each two elements as they touch become products. This is the first row of $|p_{1n}|$. Perform the same operation upon $|b_{1n}|$ with the second row of $|a_{1n}|$ to obtain the second row of $|p_{1n}|$, etc. Any element of this product is

$$p_{\kappa s}=a_{\kappa 1}b_{s_1}+a_{\kappa 2}b_{s_2}+\ldots+a_{\kappa n}b_{sn}. \qquad (8)$$

The product may also be formed by columns instead of by rows as above.

22. The operation just described may be applied to form what is conventionally called the product of two rectangular arrays of the same dimensions. Let these be

$$\left.\begin{matrix} a_{11}a_{12} \\ a_{21}a_{22} \\ a_{31}a_{32} \end{matrix}\right\} \quad \text{and} \quad \left\{\begin{matrix} b_{11}b_{12} \\ b_{21}b_{22} \\ b_{31}b_{32} \end{matrix}\right.$$

Forming the product by rows gives

$$\begin{vmatrix} a_{11}b_{11}+a_{12}b_{12} & a_{11}b_{21}+a_{12}b_{22} & a_{11}b_{31}+a_{12}b_{32} \\ a_{21}b_{11}+a_{22}b_{12} & a_{21}b_{21}+a_{22}b_{22} & a_{21}b_{31}+a_{22}b_{32} \\ a_{31}b_{11}+a_{32}b_{12} & a_{31}b_{21}+a_{32}b_{22} & a_{31}b_{31}+a_{32}b_{32} \end{vmatrix}$$

If this product array be interpreted as a determinant it can only be zero; for it is the product of the two determinants formed by writing a column of zeros after one of the given rectangular arrays and a column of elements arbitrarily chosen after the other. An entirely different result would have been obtained had the product been formed by columns instead of by rows.

23. The result of replacing each element of a

determinant by its co-factor is called the reciprocal of the determinant. Thus the reciprocal of

$$\Delta = \begin{vmatrix} a_{11} & \dots & a_{1n} \\ \dots & \dots & \dots \\ a_{n1} & \dots & a_{nn} \end{vmatrix} \text{ is } \Delta' = \begin{vmatrix} A_{11} & \dots & A_{1n} \\ \dots & \dots & \dots \\ A_{n1} & \dots & A_{nn} \end{vmatrix}.$$

Multiplying and applying the formulæ (2) and (4) to the elements of the product, gives

$$\Delta \Delta' = \begin{vmatrix} \Delta & 0 & \dots \\ 0 & \Delta & \dots \\ \dots & \dots & \dots \end{vmatrix} = \Delta^n, \quad \text{of order } n;$$

whence $\Delta \cdot \Delta' = \Delta^n$, or $\Delta' = \Delta^{n-1}$.

That is, the reciprocal of a determinant of the nth order is equal to its $(n-1)$th power.

Reciprocal determinants are a special case of compound determinants, whose elements are minors variously derived from one or more given arrays.

24. The application of determinants to the study of geometry and pure analysis has led to the recognition and investigation of numerous special forms, some of which will be defined and their most characteristic properties stated without demonstration.

Among the more important are the forms known as symmetrical determinants. In these any two elements symmetrically placed with respect to the principal diagonal, known as conjugate elements, have the same absolute value. If $a_r^{(s)} = a_s^{(r)}$ the determinant is described as simply symmetrical. If $a_r^{(s)} = -a_s^{(r)}$, a condition which cannot apply to the elements of the principal diagonal, unless these be zero, it is said to be gauche or skew. When the diagonal elements are zeros and $a_r^{(s)} = -a_s^{(r)}$ the determinant is skew-symmetric. It is very easy to show that a skew-symmetric determinant of odd order is equal to zero. When of even order, however, it is equal to the square of a certain rational function of its elements known as the Pfaffian. These functions are expressed by triangular arrays; thus

$$\begin{vmatrix} 0 & a & n & m \\ -a & 0 & b & l \\ \cdot & -b & 0 & c \\ -m & -l & \cdot & 0 \end{vmatrix} = (ca - nl + bm)^2 = \begin{vmatrix} a & m \\ b & l \\ c & \cdot \end{vmatrix}^2.$$

The properties of Pfaffians are strikingly analogous to those of determinants.

25. Determinants all of whose elements are zeros except those of the principal diagonal and the adjacent minor diagonals above and below, and in which each element of one of these minor diagonals is -1, are called continuants. They were so named by Muir because of their connection with the theory of continued fractions. If q_i be the number of terms in the expansion of the continuant of order i, it may be shown that $q_n = q_{n-1} + q_{n-2}$; a difference equation, the solution of which is

$$q_n = \frac{(1+\sqrt{5})^{n+1} - (1-\sqrt{5})^{n+1}}{2^{n+1}\sqrt{5}}.$$

26. A determinant in which the elements of the first row are functions of a given variable, the corresponding elements of the second row the same function of another variable, etc., is called an alternant. If the functions used as elements are powers of the variables it is described as a simple alternant. Such a determinant is divisible by the difference product of its variables, the quotient being a symmetrical function of these variables. Thus

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (y-z)(z-x)(x-y)(x+y+z).$$

27. When $y_1, y_2, \dots y_n$ are functions, each of $x_1, x_2, \dots, x_n$, the determinant

$$\begin{vmatrix} \partial y_1 / \partial x_1 & \partial y_1 / \partial x_2 & \dots & \partial y_1 / \partial x_n \\ \dots & \dots & \dots & \dots \end{vmatrix} = \frac{d(y_1 \dots n)}{d(x_1 \dots n)}$$

is called the Jacobian of the given functions, a name given by Sylvester. There is a complete analogy between the Jacobian and the ordinary differential coefficient $\frac{dy}{dx}$, which Bertrand has made the basis of another definition of these functions. Thus, letting

$$\Delta_i x_1, \Delta_i x_2, \dots, \Delta_i x_n \quad (i = 1, 2, \dots n)$$

be n distinct sets of increments given to $x_1, x_2, \dots, x_n$, and

$$\Delta_i y_1, \Delta_i y_2, \dots, \Delta_i y_n, \quad (i = 1, 2, \dots n)$$

the corresponding increments of $y_1, y_2, \dots, y_n$, then is

$$\frac{\begin{vmatrix} \Delta_1 y_1 & \Delta_2 y_2 & \dots & \Delta_n y_n \end{vmatrix}}{\begin{vmatrix} \Delta_1 x_1 & \Delta_2 x_2 & \dots & \Delta_n x_n \end{vmatrix}} = \frac{d(y_1 \dots n)}{d(x_1 \dots n)}.$$

If the functions be subjected to linear transformation the Jacobian is multiplied by a constant factor or modulus, which is the determinant of the coefficients of the transformation. The Jacobian is thus a covariant of the functions from which it is derived. See INVARIANTS AND COVARIANTS.

If the Jacobian vanishes the functions are not independent, and conversely.

28. The Jacobian of the partial differential coefficients of a function, taken with respect to its several variables, is called the Hessian of the function. The Hessian is a symmetrical determinant.

Thus, the given function being the ternary quadric,

$$w = ax^2 + by^2 + cz^2 + 2fyz + 2gzx + 2hxy,$$

$$H(w) = \begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix};$$

a determinant, which in this instance is also known as the discriminant, for the reason that its vanishing is the condition that w be resolvable into linear factors.

Like the Jacobian the Hessian is a covariant. Both were originally called functional determinants.

29. The theory of determinants has two notable extensions which will be explained, though little more than the definition of the functions suggested can be undertaken in the present article.

Just as n^2 elements may be arranged as a square array with two sets of parallel lines, so may n^3 elements be arranged in the form of a cube so as to lie in three sets of parallel planes. These three sets of planes may be called strata, planes, and sections, the last two corresponding respectively to the rows and columns of the square array lying in any given stratum. An element of such an array may be represented by $a_{\eta,\kappa,s}$, where η is the number of its stratum, κ of its plane, and s of its section. Then $|a_{\eta,\kappa,s}|$ represents a function known as a cubic determi-

nant. Its principal term is $a_{111}a_{222}\ldots a_{nnn}$, and the others are obtained as follows: Permute the third suffixes and in each of the $n!$ products obtained permute the second suffixes, thus obtaining $(n!)^2$ products. Then apply to each product a sign factor which is the product of the sign factor appropriate to the permutation of the third suffixes by that appropriate to the permutation of the second. The aggregate of terms thus obtained is the cubic determinant.

The sign of the cubic-determinant is changed by the interchange of two planes or two sections; but the interchange of two strata has no effect.

There are also determinants whose arrays can be represented only in hyper-space (see HYPER-SPACES, GEOMETRY OF), but whose elements may be defined by means of multiple suffixes as above. Such determinants are known as hyper-determinants.

30. In the array

$$\begin{vmatrix} a_{-\lambda,-\rho} & \ldots & a_{-\lambda,0} & \ldots & a_{-\lambda,\sigma} \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ a_{0,-\rho} & \ldots & a_{0,0} & \ldots & a_{0,\sigma} \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ a_{\mu,-\rho} & \ldots & a_{\mu,0} & \ldots & a_{\mu,\sigma} \end{vmatrix},$$

letting $\lambda+\mu=n=\rho+\sigma$, the given array represents a determinant of order $(n+1)$. If now n increase indefinitely, λ, μ on the one hand and ρ, σ on the other also becoming indefinitely large, while maintaining the above relation to n, the determinant may approach a definite limiting value, it may become indeterminate, or it may become infinite. Determinants of infinite order, as here defined, present certain analogies to infinite series.

History and Bibliography.—The first definite reference to determinants is to be found in a manuscript of Leibnitz, left unpublished at the time of his death. His later development of the idea is embodied in a communication to De l'Hospital (1693) in which he explains the formation of the eliminant of a system of linear equations identical in form with that discussed in 17. In his notation he used double indices, representing the element $a_{\kappa\delta}$ by $(\kappa\delta)$ or by κ_δ. The next approach to the subject was made quite independently by Cramer (1750), who expounded a rule for writing out the values of the unknowns in a system of linear equations, in which he recognized the two classes of permutations as given in 2. This rule found instant favor and the development of the theory of determinants has since been almost continuous.

The first attempt at a formal exposition of the theory was made by Vandermonde (1771). His treatment of the functions as independent of their connection with the process of elimination and his recognition of several of their more fundamental properties entitles him to be ranked as the real founder of the theory. Almost simultaneously Laplace gave the method, partly anticipated by Vandermonde, of expanding determinants in terms of complementary minors. The functions were called by him «resultants,» a term now used in the restricted sense explained in 18.

New applications of the functions were at once found by Lagrange (1773), principally in the domains of geometry and the theory of numbers. Their application was further extended by Gauss (1801), who used the word determinant to designate the discriminant of the ternary quadric (see 28). He also noted the significance of reciprocal determinants (see 23), and was on the verge of discovering the multiplication theorem. This theorem (see 21 and 22) was first given by Binet (1812), but its satisfactory proof is due to Cauchy.

Cauchy was the first to use the word determinant in its present sense. His memoir in the 'Jour. de l'ecole polytechnique' (1812) rounded the general theory of determinants into something like its present form. Jacobi early adopted the new calculus and greatly extended its field of usefulness. In his hands it became, not merely an indispensable system of notation, but a powerful instrument of research as well. His justly famous memoirs in 'Crelle's Journal' (1841) made the subject readily accessible and, since their publication, determinants have been freely used by mathematical writers without apology or explanation.

A new impulse was given through the study of linear transformations, in which Cayley and Sylvester led the way. The more recent developments relate mainly to special forms of determinants. Skew determinants and Pfaffians were developed by Cayley, in connection with the orthogonal transformation. He was the first writer to use the vertical bars enclosing the determinant array. Continuants were investigated by Sylvester, who also named and made much use of Jacobians and Hessians. Alternants, first recognized by Cauchy and studied by Jacobi, have been further discussed by Trudi, Nägelbach, and Garbieri. Important results relating to compound determinants were published by Schweins (1825), but these have been rediscovered and greatly extended by Sylvester, Reiss, Kronecker, and Picquet. Determinants of infinite order have been used by G. W. Hill in a memoir on the linear theory appearing in the 'Acta Math.,' vol. viii. Their properties have been investigated by Poincare, von Koch, and Cazzaniga. In recent years the arithmetical properties of determinants and the theory of elementary divisors have been discussed by H. J. S. Smith, Kronecker, Frobenius, and Weierstrass.

Muir's 'Theory of Determinants in the Historical Order of its Development' (London, 1890) is the 'standard work on the history of the subject down to 1841. The same author has also compiled a complete bibliography of determinants down to 1900 ('Quar. Jour. of Math.'). Spottiswoode (1851) prepared the first regular treatise. Other well-known texts are those of Baltzer (Leipzig, 1857); Günther (Erlangen, 1875); Dostor (Paris, 1877); Scott (Cambridge, 1880); Muir (London, 1882); Hanus (Boston, 1886); Weld (New York, 1893); Scott and Mathews (Cambridge, 1904).

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Determinative Mineralogy, that division of the science of mineralogy (q.v.) which treats of the identification of unknown minerals. The expert mineralogist is able to recognize at sight several hundred distinct species of minerals, and many varieties when the specimens brought to his notice are typical. Such ability is the result of much study and experimentation, as well as careful observation of the physical differences between the species. Some times the usually constant properties of certain minerals vary to

such an extent as to disguise the species. It is then necessary to make such tests as experience has proved are requisite in order to identify the mineral. Though the aid of an elaborate series of determinative tables is usually sought, it is always wise to make a few preliminary tests in order to learn what are some of the most prominent of the physical properties of the mineral. Quite often valuable suggestions as to the character of the mineral, and at times its identity, may be learned by testing its hardness, streak, or cleavage, or by taking its specific gravity, or by observing its crystal form, structure, lustre, color, and feel.

Hardness is a factor of prime importance in the determination of minerals. The number of exceedingly hard minerals is very small. If a mineral is not scratched by topaz, it must be some one of a dozen minerals, and these are usually differentiated with ease by other simple physical tests. Ruby is thus separated from garnet, while, if its crystal form is distinct, it may readily be distinguished from the very similar ruby spinel, which is nearly as hard. A knife-blade is all that is needed to prove that iron pyrites, or "fool's gold," is not true gold, for the latter is readily scratched by the blade, while pyrites is not. It is an excellent rule to invariably test the hardness of a mineral before making any other tests.

Streak (q.v.) is of importance with colored minerals and those having metallic lustre. The scarlet streak of cochineal-red cinnabar will instantly distinguish it from cuprite, which has the same color but a brownish-red to blood-red streak. The brown streak of manganite serves to distinguish it from pyrolusite, which has a black streak, while a test of their hardness shows that manganite is 4 and pyrolusite 2 to 2.5. The distinction between gold and pyrite is very marked, gold having a streak of the same color as the mass, while the streak of pyrite is greenish-black. This same greenish-black streak is, however, characteristic of copper pyrites, and its external color is quite similar to that of iron pyrites, but they are readily separated by the superior hardness of the iron pyrites. Such tests as these are not only most convenient in field work, but are at times conclusive. (See Mineralogy; Physical Crystallography.)

Cleavage is often an important aid in determinative work. If a lead-gray mineral of metallic lustre shows well-developed cubical cleavage, it may be safely assumed that it is galena. If a transparent mineral cleaves readily into octahedrons of large size, it is almost certainly fluorite. Sphalerite is the only mineral in which dodecahedral cleavage is highly perfect, while the excellent rhombohedral cleavage of calcite instantly distinguishes it from quartz, which it often resembles, and the separation is made conclusive by testing the hardness, which in calcite is 4 and in quartz 7.

Crystal form is one of the most important determinative factors. The characteristic cross twins of staurolite suffice to determine that species, which it would be difficult to recognize if massive. The trillings of cerussite easily separate it from anglesite, whose physical properties are very similar. Many of the zeolites and their common associates are recognized by their crystal form; thus analcite is isometric and generally in trapezohedrons, chabazite is rhombohedral, apophyllite is tetragonal. The "gridiron" structure of microcline as seen in thin sections under the microscope, which is due to twinning, serves effectually to differentiate it from all of the other feldspars. The importance of a knowledge of crystallography (q.v.) as an aid in determinative mineralogy cannot be overestimated.

Specific gravity is one of the least variable properties of minerals. Its accurate determination, therefore, may be the only test needed to positively identify a specimen. This fact is of immense importance to the jeweler, who constantly resorts to his specific gravity balance as his safest test for precious stones. Gold, too, may be thus identified, for no other yellow mineral has a specific gravity approaching it. Even the rough test of placing the unknown mineral in the palm of the hand and comparing it with about the same quantity of a known species may be suggestive as to the identity of the mineral. Thus rusty-yellow quartz sand may be instantly distinguished from the very similar but much heavier monazite sand.

While the examination of the physical properties of an unknown mineral, as above suggested, is of great value, there is but one way in which its identity can be fixed in all cases, and that is by the use of a series of determinative tables in which the mineral is referred successively from one large group to a smaller, until finally all have been eliminated but itself. The process is based largely on a series of chemical tests which, in almost all cases, give an insight into the character of the material. The scheme involves (1) the heating of a fragment in the forceps; (2) heating in a closed tube; (3) heating in an open tube; (4) heating on charcoal in the blowpipe flame; (5) fusion with fluxes on platinum wire. These processes are described under Blowpipe Analysis (q.v.).

While described species may be determined by the foregoing methods, it is at times desirable, and in the case of new species essential, to ascertain the exact proportions of the various ingredients which are present in the mineral; for this purpose it is necessary to resort to a complete quantitive analysis. See Chemical Analysis.

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Determinate Problem, a problem in geometry which admits of a limited number of solutions, an indeterminate problem admitting of an indefinite number of solutions.

Deter'minism, a name applied by Sir William Hamilton to that system of philosophy which holds that the will is not a free agent, but is irresistibly determined by providential motives, that is, by motives furnished by Providence, which turn the balance in our mental deliberations in accordance with its views. Determinism is often mistakenly confused with materialism and atheism. It does not deny moral responsibility though holding a man cannot choose to act in a certain way while he

prefers with his whole nature to act in another way. This doctrine of the necessitarian philosophers expounds in short that whatever happens is entirely determined by antecedent causes.

Detlef, Karl, kärl dĕt'lĕf, pseudonym of Klara Bauer, German novelist: b. Swinemünde 23 June 1836; d. Breslau 29 June 1876. Her 'Indissoluble Bonds' (1877) and 'Must It Be?' (1872), are valuable and engrossing studies of character.

Detmold, dĕt'mōld, Germany, city, capital of Lippe, on the Werra, 50 miles southwest of Hanover. It consists of an old and a new town, the former poorly, the latter regularly built. Its principal edifice is the palace, a fine old castellated building, with a vast round donjon tower. In the vicinity, on the Grotenberg, the loftiest summit of the Teutoburger Wald, a colossal statue, 45 feet high, placed on a solid circular pedestal twice that height, has been erected to the Hermann or Arminius who overthrew Varus and his legions. Pop. 11,542.

Det'onating Powder, certain chemical compounds, which, on being exposed to heat or suddenly struck, explode with a loud report, owing to one or more of the constituent parts suddenly assuming the gaseous state. A mixture of equal volumes of chlorine and hydrogen exposed to direct sunlight detonates violently, forming hydrochloric acid gas. The chloride and iodide of nitrogen are very powerful detonating substances. The compounds of ammonia with silver and gold, fulminate of silver and of mercury, detonate by slight friction, by means of heat, electricity, or sulphuric acid. The compound used in the priming of percussion-caps and fuses is the fulminate of mercury or silver, collected as a precipitate when the metal, dissolved in nitric acid, is poured in warm alcohol and then collected, washed, and dried.

Det'onators are the devices used in firing high explosives by detonation. They consist of small cylindrical copper tubes closed at one end and charged with mercuric fulminate or a mixture of mercurial fulminate and potassium chlorate which is compressed in the bottom of the tubes. Those used for blasting in mines and quarries are also known as blasting caps and exploders. They are rated as single force, double force, triple force and so on, the charge for the single force cap being about five grains of the detonating substance and the charges for the higher force increasing about two grains for each grade. To fire them a piece of Brickford or "running" fuse of the desired length is inserted in the mouth of the detonator or cap and then the copper tube is bent or "crimped" securely about the sides of the fuse. The detonator is inserted in the bore hole so as to come in close contact with the first cartridge or "stick" of explosive and the bore hole is filled with tamping. When a flame is applied to the end of the fuse that projects from the bore hole, the column of powder in the fuse takes fire, the fire travels slowly down to the charge in the detonator, causing the detonation of the dynamite.

For military mines and naval torpedoes and, to a considerable extent, for commercial blasting, detonators to be fired by an electric current are employed. These are known as electric detonators. They differ from those previously described only in that the mouth of the copper cap is closed by a plug made of sulphur and ground glass, through which two copper wires, known as the "legs of the detonator," are led. Inside the cap these wires are bridged over by a very fine wire made of an alloy of iridium and platinum. Around the bridge and between it and the fulminating composition is placed a layer of mealed gun-cotton. When it is desired "to fire," the legs of the detonator are connected with a dynamo-electric machine and the current generated. As the current passes it heats the bridge to incandescence, which sets fire to the guncotton; this causes the fulminate to detonate, and this detonates the charge of dynamite or other high explosives. The electric detonators used in the United States navy contain 35 grains of mercuric fulminate, this large quantity being used to make sure that the detonator will do its share of the work in torpedo attacks on an enemy. See DETONATING POWDER; EXPLOSIVES.

Detri'tus, applied in geology to accumulations formed by the disintegration of rocks, may consist of angular and sub-angular debris, or of more or less water-worn materials, such as gravel, sand, or clay, or an admixture of these. Especially applicable to that fragmentary matter which if consolidated into a solid would form what is known as breccia.

De Trobriand, dē trō-brē-äṅ, **Philippe Regis,** BARON, American soldier: b. Tours, France, 4 June 1816; d. Bayport, Long Island, 15 July 1897. He was educated at the University of Orleans, studied law at Poitiers, and came to the United States in 1841. He was commissioned colonel of the 54th Volunteers in the Civil War 1861; and was appointed brevet brigadier-general in 1867. He was editor and publisher of the 'Revue du Nouveau-monde,' New York, 1849–50, and joint editor of the *Courier des Etats Unis* 1854–61. Among his works are: 'Les Gentilshommes de l'Ouest' (1841); 'Quatre ans de campagnes a l'Armee du Potomac' (1867).

Detroit (Fr. *détroit,* strait), Mich., capital of Wayne County, in the southeast; largest city of the State, and of the entire Northwest to the Pacific; 13th of the United States; on the northwest bank of the Detroit River dividing the United States from Canada, one end six miles below Lake St. Clair and the other about 14 from Lake Erie. It is 88 miles from Lansing, the State capital; 284 from Chicago; 60 from Toledo, Ohio; 251 from Buffalo; and 291 from Mackinaw. Pop. (1900) 285,704; (1903) about 325,000.

Detroit has the finest harbor on the Lakes; the river, on the city front, is often called "the Dardanelles of America." The broad outlet of Lake St. Clair, running west and dividing around Belle Isle, narrows to about half a mile and deepens to an average of 32 feet for some miles with a southwest course, before turning directly south, with a current of about two miles an hour. Fed by the Great Lakes, it has always a full stream, neither rising nor sinking much, and is little disturbed by storms; and the largest vessels can lie up to the wharves. Here is built Detroit, extending some seven miles along the river front, lined with wharves, elevators, foundries, warehouses, railroad stations, and freight depots, etc.; and about three miles deep, except in the centre, where it is nearly

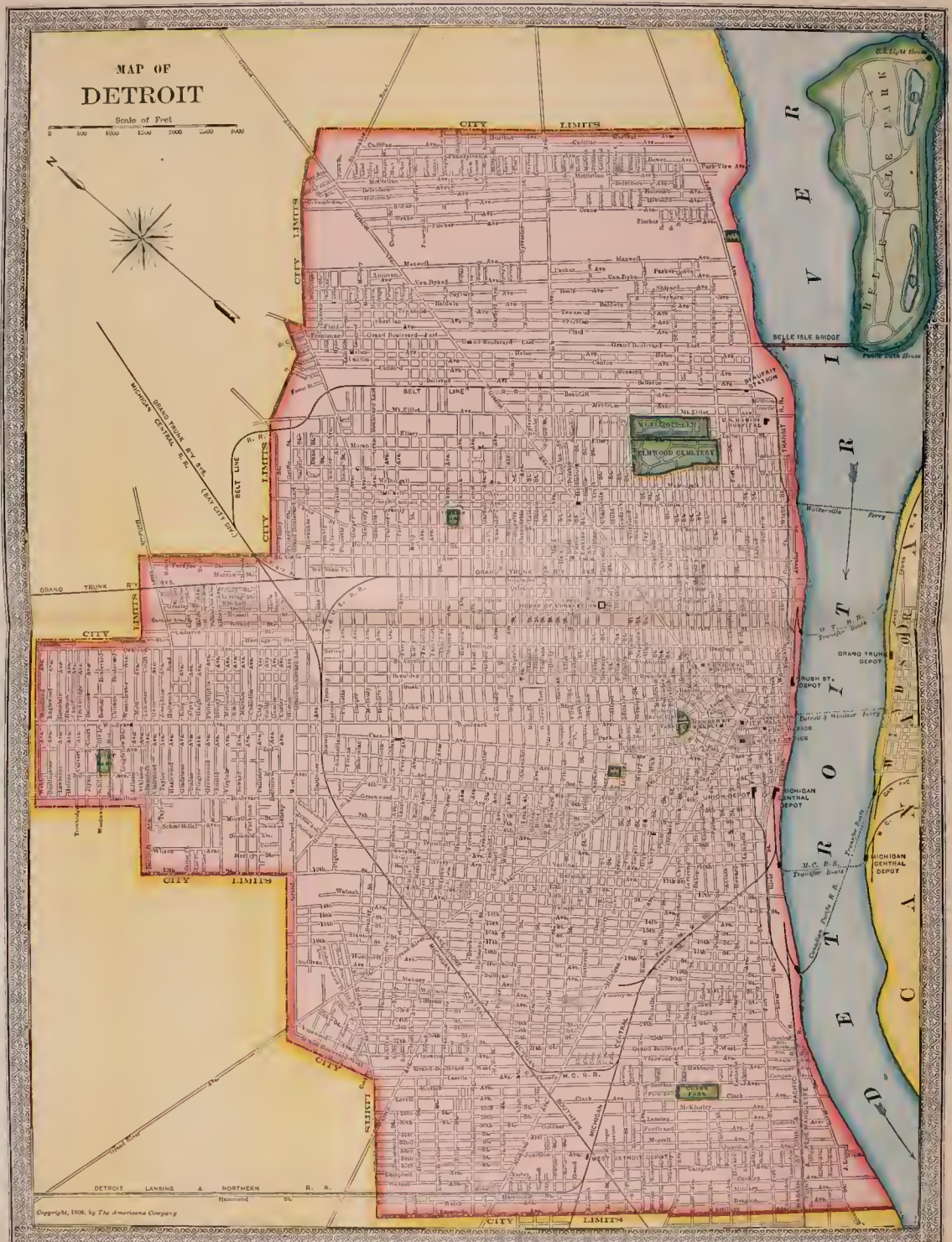
d[illegible]. Area, 29¼ square miles, but with well-built suburbs outside not yet incorporated; indeed, from Grosse Pointe at the north where Lake St Clair ends to Gibraltar at the south where Lake Erie begins, the whole river front for 25 miles is built up with handsome villages, and lined with the summer villas of its wealthy business men, all really part of Detroit. At its southern corner, commanding the channel, is Fort Wayne, an unfinished military post once intended to be the most formidable fortification in the North-west, and still garrisoned and armed with batteries. Across the river in Canada are Windsor in the centre, the terminal of railroads through Canada, Walkerville on the north and Sandwich on the south.

The ground of Detroit is a gentle slope for 300 or 400 feet back from the river to 20 or 30 feet high; then sinks slightly, and again rises to about 50 feet, and 601 above the sea. The original plan, on a very small scale, was a series of concentric semicircles, or rather segments of polygons, with the Grand Circus — a semicircular park of five and a half acres — as a centre, nearly a mile from the river, toward which they extended. This feature is still preserved; but all the new growth has been laid out in checkerboard system, relieved by a series of noble avenues 100 to 200 feet wide radiating from the river. Jefferson Avenue extends along it; Woodward Avenue runs at right angles to it, dividing the city into halves and the Grand Circus into quadrants; south of Woodward are Michigan and Grand River avenues, at different angles and north is Gratiot. Between the Grand Circus and the river is the Campus Martius, an open space about 600x200 feet, crossed by Woodward and Michigan avenues, and from which start Monroe Avenue, and Fort Street running to Fort Wayne. The streets are generally wide. — 50 to 100 feet, — well shaded, and notably clean; some 300 miles of them are paved with brick and asphalt. The chief business street is Woodward Avenue. Jefferson Avenue is another leading one; Griswold Street, with the great banking houses, the custom-house, office buildings, etc., is the Wall Street of Detroit; and others about the Campus Martius are of importance. The chief of the show streets is the Grand Boulevard, a macadamized parkway 150 feet wide and 11 miles long, encircling the heart of the city in a vast sweep from Belle Isle bridge at the east to Fort Street near the western boundary. The outer portions of all the great avenues mentioned, of Lafayette Avenue, and of Fort Street, are full of fine residences; and a notable residence district clusters around Woodward Avenue as it stretches toward Palmer Park.

Public Buildings and Monuments.— The chief of these are on or near the Campus Martius. Within it, facing the city hall, is the Michigan Soldiers' and Sailors' Monument, by Randolph Rogers, of bronze and granite, 55 feet high, with a colossal bronze allegorical statue of Michigan on the summit; it cost $75,000. On the west, facing four streets, is the city hall, three stories and mansard, of sandstone in the Italian style; 200x90 feet, 86 feet high to top of cornice, 180 to top of tower; it cost $600,000, and is one of the finest in the West. Near by are the handsome Wayne County court-house, the largest public building in the city, and the splendid Majestic office building. On the north of the Campus is the Detroit Opera House. The custom-house occupies the old post-office, on Griswold Street, and the magnificent new post-office is on Fort Street, west of the City Hall. The Chamber of Commerce, the Athletic Club, and Y. M. C. A. buildings, the House of Correction, and the magnificent passenger stations, — the Michigan Central, and the new Union station at Fort and Third, — are all conspicuous. The churches will be mentioned later.

Public Service and Improvements, etc.— The city is exceedingly well sewered, and its death rate is very low, — 12.03 per 1,000 in 1901. The water supply is taken from a crib in Lake St Clair, 1,500 feet out, at a depth of 40 feet; the system has over 600 miles of pipes, and has cost above $6,000,000. It is supported partly by rates, and partly by a city tax. The electric lights are partly arc lights on high towers; there are about 1,800 in all. The electric railway system has over 200 miles of track within the city limits, and over 300 in suburban lines outside to every quarter; and ferries run to Windsor and Walkerville in Canada. There is a bridge over the American half to Belle Isle, but none over the full stream. There are three railway passenger stations, — the Union, the Michigan Central, and the Brush Street, all on the water front not far apart. The fire department has 27 steam fire engines, 6 chemical engines, 10 hook and ladder companies, 6 supply wagons, 2 fire boats, and a water-tower; besides reserve engines, etc. There are 434 fire-alarm boxes and 3,427 hydrants. The police system has seven precinct stations and six sub-stations, a signal office, and a harbormaster.

Parks, Pleasure Resorts, Public Amusements, etc.— Detroit has 21 public parks; besides a number of small triangular squares caused by the intersection of the radiating avenues with the streets, often with fountains. The largest, and the principal public resort, is Belle Isle in the river, whose entire 707 acres have been parked with great beauty at a cost of over $1,500,000, including a ring of little lakes and canals. It is reached by a handsome iron bridge built in 1889, at a cost of $315,000; and is to be increased 100 acres by taking in the southwestern shoals. The next largest is Palmer Park, of 141 acres, on Woodward Avenue, about 6½ miles from the river, sedulously made a colonial museum; it has a colonial log house, and a most interesting collection of colonial and other historical relics, besides a colonial casino. Clark Park in the west has about 25 acres; Voigt Park 8½; and the Grand Circus, in each of whose quadrants made by Woodward Avenue there is a fountain, 5½ acres. Besides these, there are opportunities for delightful summer trips on the river and lakes; and the river is dotted with charming places where excursion steamers run, from Grosse Pointe, on Lake St. Clair, famed for its cherry orchards, to Grosse Isle where Lake Erie opens. There are nine theatres and opera houses in the city, the largest of which are the Detroit and Whitney's opera houses, and the Lyceum. The finest cemeteries are Elmwood (Protestant) and Mt. Elliott (Catholic) side by side on the northeast, about two miles from the centre, beautiful in keeping and monuments; and Woodmere, some four miles to the southwest on high ground, is another beautiful one. Woodlawn,


MAP OF
DETROIT
Scale of Feet
0 600 1000 1500 2000 2500 3000
N
CITY LIMITS
BELT LINE
GRAND TRUNK R'Y SYS.
MICHIGAN CENTRAL R. R.
(GRAND TRUNK R'Y SYS.)
(GRAND CENTRAL DEPOT)
WOODMERE CEMETERY
ELMWOOD CEMETERY
BELLE ISLE PARK
BELLE ISLE BRIDGE
DETROIT RIVER
DETROIT & WINDSOR FERRY
BELLE ISLE FERRY
BELLEVUE FERRY
BELLEVUE TRANSIT
BEAUBIEN STREET STATION
GRAND TRUNK DEPOT
BRUSH ST. DEPOT
MICHIGAN CENTRAL DEPOT
MICHIGAN CENTRAL DEPOT
M. C. R. R. Transfer Tracks
Detroit & Windsor Ferry Slips
Belleview Ferry
Belle Isle Ferry
Detroit River Tunnel Co.
Canada Southern R. R.
Detroit River Tunnel
Detroit Lansing & Northern R. R.
Hamtramck
Highland Park
Detroit
Grand River
Michigan Central R. R.
Grand Trunk R'y
Detroit Lansing & Northern R. R.
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1. Cadillac Square; County Building and Soldiers and Sailors' Monument.
2. Belle Isle Park; The Grand Canal.

a new and beautiful cemetery just opened, situated seven miles out Woodward Avenue, and Mt. Olivet, another large (Catholic) cemetery about seven miles out at the northeast. There are a number of Lutheran and Jewish cemeteries.

Schools, Libraries, Newspapers, etc.— In 1902 the public school system had 72 buildings, 66 brick and 6 wood, besides a central office building; and 3 high schools. There are, in addition to the above, 56 private schools in the city. Total number of teachers employed, 1,288; total number of children of school age, 83,215; total number of children attending school, 51,554; and the expenditures were $1,286,708. There is no Protestant nor non-sectarian institution for general higher education, the University of Michigan at Ann Arbor being only 37 miles away; but the Jesuits have Detroit College, opened 1877. There are also several special professional colleges: three medical, including the Detroit College of Medicine, with schools of pharmacy and dentistry, and Michigan College of Medicine and Surgery, Detroit Homeopathic College, and the Detroit College of Law. There are 82 periodicals, including 7 dailies, 2 of which are German. The one great library is the Detroit Public Library, opened 1865, containing nearly 200,000 volumes, and with branches in each high school as well as several outside. But Andrew Carnegie has offered to give $750,000 for a library, if the city will expend $75,000 a year in its support; the offer has not been accepted. The Hurlbut Library at the waterworks is also utilized as a distributing station. The Bar Association has a law library; and the Masonic lodges, the Trades Union Council, and the Museum of Art have also libraries. The latter institution, in part supported by a city tax, has a good collection of historical and archæological, art, and scientific relics and examples, valued at $300,000. These include the Stearn's Oriental collection, one of the finest in the country, and the Scripps gallery of old masters.

Churches and Charities.— In 1902 there were 200 religious societies in Detroit. The chief denominations were Roman Catholic (36 churches including the cathedral, it being the seat of a bishop), Methodist Episcopal (29), Lutheran (26 of different synods), Baptist (18), Presbyterian (15), German Evangelical (11), Congregational (10). There were also five Jewish synagogues and a temple; and several Catholic convents. Of the church buildings, the largest is the cathedral. Architecturally may be noted Ste. Anne's, and the Convent of the Sacred Heart, on Jefferson Avenue (both Catholic); the First and Fort Street Presbyterian; the Central Methodist; Trinity, St. John's, and Christ (Episcopal); Woodward Avenue Baptist; Church of Our Father (Universalist); First Unitarian; and the Temple Beth El.

The charities include a city poor fund, managed by a commission; and the Detroit Associated Charities. There are four large general hospitals, of which the most noted are Grace and Harper, with training schools for nurses; St. Mary's (Catholic) and the United States Marine Hospital. Besides these are some two dozen allied institutions,— lying-in hospitals, homes for Magdalens, foundlings, and orphans, the aged, etc. The House of Correction, whose buildings, grounds, and appliances have cost some $600,000, is of world-wide note.

Commerce and Industries.— Detroit is a highway through which passes all the commerce between the upper and lower lakes, to the volume of probably 50,000,000 tons yearly, or more than double that of the Suez Canal. It is the terminus of a great number of lake steamer lines, freight and passenger, and a chief calling point for others; and one of the greatest distributing points both by boat and rail between the United States and Canada, with which it does three fourths of its "foreign" trade. In 1902 its exports were $18,053,055, greatest of all the ports opposite Canada; and its imports $3,469,077. Of the really foreign trade, extra-continental, the greater part is to England. The exports are grain and flour, swine and their products, cattle, beef, and hides, sheep and wool, and lumber; though the latter trade has greatly declined of late years, as the Michigan pine forests have been stripped. Besides this, it receives and uses or ships east vast quantities of the produce of Michigan, of which it is the natural emporium; wheat, corn, and barley, hops, apples, dairy products, etc., besides those above mentioned. Its annual clearances of vessels are about 3,300, with a gross tonnage of over 500,000. It has the largest dry-dock on the lakes. Besides the water lines, it is the centre of seven great railroad lines, most of them among the chief trunk lines of the West and Canada; the Lake Shore, Michigan Central, Grand Trunk, Canadian Pacific, Père Marquette, Wabash, and Detroit Southern.

The manufactures of Detroit in 1900 turned out $100,892,838 in finished product, employing $71,751,193 of capital and over 51,000 workmen and officials, and paying nearly $24,000,000 in wages and salaries. The increase from 1890 was 63 per cent in number of establishments, and 30 per cent in value of product: a healthy sign, indicating greater diversity of industries and development of medium businesses. There is a large employment of skilled labor, as in optical goods ($225,000), professional and scientific instruments, etc. The greatest single item was in foundry and machine-shop products, $8,943,311; but if we add the allied industry of making the iron and steel itself — over $3,000,000, — the steamfittings and heating apparatus, and the architectural ironwork, the general iron and steel manufacture will come up to nearly $15,000,000. Next to this is the manufacture of tobacco products, amounting to over $6,500,000. Manufacturing chemicals and druggists' products is the third immense specialty, $4,915,913, the creation of the past 20 years almost wholly. Malt liquors come next. Furniture and carriages, using more skilled work to less stock, have largely supplanted the coarse lumber and planing-mill work once a chief industry. Brass castings are a heavy item; slaughtering and meat packing is important; and paints and varnishes occupy a prominent position.

Government, Finance and Judiciary.— The city is divided into 17 wards. The city council has but one chamber, and the council and the mayor are elected for two years. Most of the officials and commissions are elected; some are appointed by the council on the mayor's nomination; and the board of health is appointed by the governor of the State. The finances are regulated by a board of estimates. The city is the seat of the United States circuit court

for the sixth circuit, the district court for the eastern district of Michigan, the Wayne County circuit court, and local courts. The principal officials of the Lake Survey and the department in charge of the lake lighthouses have their offices here. The city's limit of borrowing is 2 per cent of its assessed valuation; which was about $250,000,000 in 1902. The tax rate was 2.13, and the amount raised $5,822,810.44. The net debt was $3,503,908.74. The banks of the city on 15 July 1901 consisted of 8 national, 14 savings banks, 2 trust companies, and 2 private banks. The joint-stock banks reported $70,553,247 resources, $7,850,000 capital, $2,070,000 surplus, and $80,221,322 deposits.

Population.— Detroit's figures since the first census taken 1820, are as follows: 1820, 1,422; 1830, 2,222; 1840, 9,102; 1850, 21,019; 1860, 45,619; 1870, 79,577; 1880, 116,340; 1890, 205,876; 1900, 285,704. Of these, 180,201 were native born; 99,503 foreign; 4,111 were colored. The total of foreign and those with foreign-born parents was 184,892; and the native white population of native parentage was but 61,300. But as about 32,000 of the foreign-born were English of England or Canada, and others from Scotland, Ireland, etc., the English element is about 100,000.

History.— The white man first visited Detroit, so far as records show, about 1655, and the first map of the region was published in 1656. The first settlement was made 24 July 1701, by Antoine de la Mothe Cadillac (q.v.), who had been governor of Michillimackinac, and wished to establish a permanent post for the centre of French power and commerce in the Northwest. He built Fort Pontchartrain, and settled it with 50 soldiers and 50 colonists. At the close of the French and Indian war, on 29 Nov. 1760, Maj. Robert Rogers took the place from the French commandant, Capt. Belestre, by order from the Marquis of Vaudreuil; the garrison were sent off as prisoners, but the Canadian inhabitants were allowed to retain their farms by swearing allegiance to the British crown. The first act of Pontiac's conspiracy in 1763 was to attempt seizing Detroit; but he was foiled, and after a desperate siege from 9 May to 12 October, heroically sustained by Maj. Gladwyn, the post was relieved, alone of all the western forts. In 1778 there were about 300 inhabitants, living mostly in log cabins, with a Roman Catholic Church; in that year the British built Fort Lernault, renamed Fort Shelby by the Americans on obtaining it, which was not till 1796. As part of the Northwest Territory, it came under the Ordinance of 1787, and in 1802 was incorporated as a town, but in 1805 was obliterated by fire except two buildings. It was rebuilt, and became the capital of Michigan Territory. In the War of 1812, William Hull surrendered it to the British under Isaac Brock on threat of a general massacre of the inhabitants by Brock's Indians. Hull was court-martialed for this act. The British, however, evacuated it the next year, and the Americans reoccupied it 29 September. It was incorporated as a village in 1815 and as a city in 1824. It remained the capital of the Territory till 1837, when Michigan became a State; then of the new State till 1847. Detroit celebrated its centennial 24 July 1901. Consult: Farmer, 'History of Detroit and Michigan' (1889), and 'Detroit' in 'Historic Towns of the Western States' (1901); Burton, 'Cadillac's Village' (1896); Parkman, 'Conspiracy of Pontiac' (1867); 'Landmarks of Detroit,' Ross and Catlin (1898).

C. M. Burton.
Author and Historian.

Detroit, Minn., county-seat of Beaker County; on Detroit Lake, and the Northern Pacific Railroad; about 200 miles northwest of St. Paul. The town is the trade centre of a rich agricultural district, and a popular summer resort because of its situation in the beautiful lake region of Minnesota. Pop. (1900) 2,000.

Detroit River, a river or strait which connects Lake St. Clair and Lake Erie, and forms part of the boundary between the United States and Canada. *Detroit* is the French word for strait: and the name was given by the French, the first white men who settled here. Its course is nearly south, with slow current, and sufficient depth of water for the navigation of large vessels. It is 25 miles long and three fourths of a mile wide opposite the city of Detroit, where it forms an excellent harbor. The tonnage passing through this river exceeds in volume that passing through any other river in the world.

Dettingen, dĕt'tĭng-ĕn, Germany, the name of several places in Germany, but the only one particularly deserving of notice is a village of Bavaria, on the Main, nine miles northwest of Aschaffenburg. It is noted for the victory gained in 1743 by the English and Austrians under George II. of England over the French under Marshal Noailles, in the war of the Austrian succession.

Deucalion, dū-kā'lĭ-ŏn, in Greek mythology, father of Hellen, ancestor of the Hellenes or Greeks, was the son of Prometheus and was king of Phthia. The following is the myth with which his name is connected. Zeus, it is said, determining to destroy mankind by water, on account of their impiety, brought a flood upon the earth, by means of a violent rain; Deucalion saved himself and his wife Pyrrha by building a wooden vessel which floated safely to the top of Mount Parnassus. After the flood had subsided they consulted the oracle of Themis to know what they must do to repair the loss of mankind, and were directed to veil their faces and throw behind them the bones of their mother. Understanding their mother to signify the earth, and her bones the stones, they did as the oracle directed. The stones thrown by Deucalion became men and those thrown by Pyrrha became women.

Deus, Joao de Rogueira Ramos, zhō-owñ roo-jā'rā rā-mōsh dā dā-oosh, Portuguese lyric poet: b. Sao Bartolomeu de Messines, province of Algarve, 8 March 1830. He is regarded by his countrymen as introducer of a new era of Portuguese poetry. National spirit, originality, sensibility, and rhythmic melody characterize his poems. They are published in 'Field-flowers' (1870); 'A Branch of Blooms' (1870); etc.

Deus Ex Machina, dē-ŭs ĕks măk'ĭ-nạ ("a god out of the machine"), a Latin phrase used to designate some unknown supernatural cause introduced to explain phenomena that one is not able to account for by natural means; or applied to some extraordinary and unlooked-for agency introduced to solve a difficulty or the like. The phrase is taken from the practice

in the Greek and Roman theatres of introducing a god from above by means of some mechanical contrivance whenever it was necessary to cut some dramatic knot which could not be loosed by the human actors.

Deuteron'omy (Gr. *deuteronomion*, the duplicate law, or duplication of the law, from *deuteros*, "second," and *nomos*, "a law"), the last of the books of the Pentateuch, so called from its consisting in part of a restatement of the law as already given in Exodus, Leviticus, and Numbers. It contains also, in addition to special commands and admonitions not previously given, an account of the death of Moses. This book presents the third and latest phase of the development of the Mosaic legislation. Its great aim is to check the encroachments of idolatry, and to concentrate the national worship in the great sanctuary at Jerusalem, especially at the three annual festivals. It is instinct with the prophetic spirit, and lays stress on the great commandment to love and fear God with the whole heart as the sum of the law. It is supposed by many critics that the book of the law found by Hilkiah, the high priest, in the house of the Lord during Josiah's reign (II. Kings xxii. 8–13) consisted of the larger portion of Deuteronomy. It may be divided into (1) four parting addresses of Moses to the Israelites in the plains of Moab, ch. i.–xxx.; (2) the charge to Joshua and to the priests, with the committal of the book of the law to the keeping of the latter, and his song, xxxi.–xxxii. 47; and (3) three appendices, namely, (*a*) announcement to Moses of his approaching death, xxxii. 48–52, (*b*) the poem conveying his blessing on the tribes of Israel, ch. xxxiii., and (*c*) an account of his death, ch. xxxiv. The authorship of this book has been traditionally assigned to Moses, with the exception of the few concluding verses which narrate his death, and which by many of the conservative school of theologians have been ascribed to Ezra. Of late years much critical labor has been bestowed on this and the four preceding books, constituting the Pentateuch, and the Mosaic authorship of the whole has been both assailed and defended with considerable learning and ability. See PENTATEUCH.

Deutoplasm. See EMBRYOLOGY.

Deutsch, doich, Emanuel Oscar Menahem, German Orientalist: b. Neisse, Silesia, 28 Oct. 1829; d. Alexandria, Egypt, 12 May 1873. His education was obtained at the University of Berlin and in 1855 he went to England to fill an appointment in the library of the British Museum, where for 15 years he studied and wrote. He is best known by his brilliant article on the 'Talmud' in the 'Quarterly Review' (1867), to which he also contributed an article on 'Islam' (1869). He was a valued contributor to the first edition of Chambers' 'Encyclopædia,' for which he wrote nearly 200 articles. A volume of his 'Literary Remains,' with sketch of his life was published in 1874.

Deutsch, Gotthard, American Hebrew scholar: b. Kanitz, Austria, 31 Jan. 1859. He was graduated from the University of Virginia in 1881. He is professor of Hebrew at Union College, Cincinnati. Besides his scholarly works, 'Symbolik in Cultus'; 'Theory of Oral Tradition'; and 'Philosophy of Jewish History,' he has published 'Andere Zeiten,' a novel.

Deutz, doits, Prussia, town in the province of the Rhine, on the river Rhine, opposite the city of Cologne, with which it is now incorporated. It is connected with Cologne by a bridge of boats 1,400 feet long. It is strongly fortified, as part of the defenses of Cologne — forming, in fact, a tête-du-pont. Deutz is a very ancient place, and is said to owe its origin to a castle built on its site by Constantine the Great. Pop. 17,782.

Deutzia, doit'sĭ-a or dūt'sĭ-a (so named in honor of the Dutch botanist Deutz), a genus of plants of the natural order *Saxifragaceæ*, containing seven or eight species, all of which are interesting for the beauty of their flowers. Some of the species are cultivated in America as hothouse flowers, or ornamental shrubs. The nearest relatives growing wild in the United States are the syringas. The deutzias are small shrubs indigenous to China and Japan, and northern India. They are covered with stiff, stellate hairs, on which account one species (*D. scraba*) is used by joiners in Japan to polish wood. The flowers are arranged in thyrsi like the lilac.

Deux-ponts, dė-pôn, the French name for the German town of Zweibrücken, in Latin *Bipontium*, all which names signify two-bridges. There was formerly a county of this name, which took its name from this town, which is now in the Bavarian Palatinate. It was afterward erected into a duchy. By the Peace of Lunéville (1801) the duchy was ceded, with all the left bank of the Rhine, to France, and afterward composed a part of the department of the Donnersberg. It contained 70,000 inhabitants, on 760 square miles. By the peace of 30 May 1814 it was restored to Germany. See ZWEIBRÜCKEN.

Deva, dā'va (Lat. *deus, divus*), among the Aryans in general, an epithet of divine persons and things; hence often opposed to the *dev* of the Parsees. It is commonly applied to the goddess Durgā, the wife of Siva, of terrific form and irascible temper. Devakātmajā is the mother of Krishna, who is also named Devākī. Devatarū is the holy fig-tree, belonging to Sverga or paradise. Devatā denotes a deity; Devadatta, the younger brother of Buddha, who is called Devadattārraja (Deodatus senior). Devadeva is a name of Brahma; Devapati is Indra, the god of the sky; Devayajna is the Homa or burnt sacrifice; Devarishi a celestial saint. There are a great many classes or choirs of inferior devatās, who are ministers to the higher gods, such as the 12 Adityas or forces of the sun; the Maruts or winds, the celestial musicians; in short, endless motley hosts with variable attributes. See BRAHMA.

Devanâg'arî, dā-va-nä'ga-rē (lit. "town-script of the gods"), the character most widely understood by Hindu scholars, in which Sanskrit works are usually printed, unless when in Roman letters. See SANSKRIT, ALPHABET.

Devaprayaga, dā-vä-prä-yä'gä, or **Deoprayag,** India, a sacred city of the Hindus, in the district of Garhwal, Northwest Provinces, on a mountain side, 2,266 feet above the sea, in the fork of the Alaknanda and the Bhagirathi, which join to form the Ganges. Devaprayaga possesses a notable temple, and is a favorite place of pilgrimage.

Developing in Photography. See NEGATIVE, DEVELOPMENT AND TREATMENT OF.

Development, when joined with the word theory, has often been used as a synonym for the term evolution, to denote the slow and gradual process by which, according to natural laws, animals and plants have passed from lower and simpler forms to higher and more specialized organisms. When used alone the word is employed in biology to signify the successive and more rapid changes which plants and animals undergo in passing from the embryo to the adult stage of individual life. This restriction is here observed in treating of development in animal life illustrated by examples shown in the accompanying plate. The changes taking place in the egg, or in the fœtus within the body of the parent, are described under EMBRYOLOGY.

After leaving the egg stage, or having been separated from the body of its parent, the animal is either complete in its organization, like the parent, or it passes through successive larval stages before it reaches the perfect form of adult life. A remarkable fact about the larval stages is that the organs are adapted to the necessities of each change in the development, so that the young may live to perpetuate the species, even though the parents die. Familiar illustrations of these transformations are recognized in the youthful period of butterflies and bees. But there are lower grades of animal life, in which the metamorphoses of the young are no less striking.

Among the crinoids, of the branch *Echinodermata*, which includes the starfish, is a genus lily-like in appearance which, as soon as the embryo is hatched from the egg, consists of little more than a mouth surrounded by hair-like processes called cilia. These delicate organs resemble eyelashes and are the forerunners of legs, fins, and wings in animals of more advanced types. In the young crinoid they are used for swimming and for drawing food into the mouth. Within a few days after it is set free in the water, this larva develops a calcareous stem surmounted with a cup or calyx and attaches itself to some object on the sea bottom. Soon afterward the calyx opens and expands like the sepals of a flower; long, arm-like tentacles grow out; the stem breaks off, and the adult crinoid becomes again a free swimmer. (See Plate 6, 6a.)

Higher in the scale of animal life, in the class *Crustacea*, are the *Cirripeds* (curly-hair footed) or barnacles. The adult is covered with a head-like shell, within which are contained the organs — the digestive apparatus, the double eye, and the numerous feet. Some barnacles by a fleshy peduncle attach themselves to a rock or to the bottom of a ship; others are attached by their sucking antennæ. In this sessile or stalked condition the barnacle opens its shell, and by the vibration of its feet captures its food, or again closes its shell to avoid danger. But after the hatching of the embryo, the larva, floating in the water, has but three pairs of feet, a pair of horns, a single eye, and a shield covering the back. This is known as the *nauplius* stage. After several moults, each accompanied by a change of structure, it enters the *Cypris* stage. The bivalve shell replaces the larval shield, and seven pairs of appendages are added. This free swimming stage is of short duration, and the animal fastens itself to some fixed object or to a sailing vessel. (3, 3a.)

The inhabitants of the water, like those of the land, are often infested with parasites. Of these the crustaceans furnish a large number. These enter as unwelcome guests the bodies of starfishes, ascidians (4b), and of many other sea animals. They inhere in the skin of fishes and cetaceans, or like the cirriped, the peltogaster, attack the unprotected part of the hermit crab. The larvæ of these pests quit the egg in the partly developed stage of *nauplius*, and through numerous moultings reach the adult form. The female often surpasses the male in the number of these changes, and is the larger of the two. (5, 5a.) Passing to the Crustacean Decapoda — the shrimps, lobsters, crayfish, and hermit crabs — the embryo stage of development is much more advanced than that of any other of the groups already mentioned. These long-tailed crabs are characterized by 20 segments of the body, and 19 pairs of appendages. The embryo-shrimps break the egg in a more complete form known as *zoea* — a stage which includes the carapax and the first four pairs of appendages. A second stage produces the five pairs of locomotive feet attached to the thorax, and the six pairs of egg-supporting feet joined to the abdomen. (2, 2a, 2b.)

Among the lowest forms of *Vertebrata* are the class *Elasmobranchii*, including sharks and skates. Interest in these animals is directed to the difference between their appearance and their structure. They look like fishes, but they are not strictly such. Their skeletons are not bony, but are cartilaginous. While the form of the adult points forward to the teleosts, or true fishes, the young shark, as the dogfish, and the young skate, as the torpedo, both in their form and structure point back to the higher invertebrates, the shrimps and crayfish. In form and in swimming organs these larvæ are similar and suggest the lower kinship. Yet the one develops into the elongated body of the dogfish with ordinary-fish like pectoral fins (8, 8a), and the other changes into the broad, flattened shape of the torpedo, with exaggerated pectoral fins scarcely distinguishable from the body (7, 7a).

In the sub-class *Teleostei*, or perfect-bone fishes, the group of *Heterosomata*, or flatfishes, including the English turbot and plaice, and the American halibut and flounder, present striking changes in development. At the stage of birth, and for some time afterward, the young show the bilateral symmetry common to other teleost tribes, swimming with their broad side vertical, an eye on each side. Gradually there is a tendency to lean to one side, which increases; the skull twists the other way, the under eye goes with the head, until a complete readjustment has been effected, and the fish swims with its flat surface parallel with the sea bottom and with its two eyes looking upward. (1, 1a, 1b.)

Development Hypothesis, in biology, the hypothesis or theory that species were not each of them a separate creation, but by some process or other came from previous species, the only exception, if any, in existence, being one or more primordial forms. By a similar process arose also the greater differences of structure, according to this theory, which distinguish genera, families, orders, classes, and even higher



1, 1a, 1b. Various stages of the Turbot. 2, 2a, 2b. Development of the Shrimp. 3. Free-Swimming form, and 3a. Sessile form of Barnacle. 4, 4a. Forms of a Nautopterus. 4. Female living in body of an Ascidian. 5, 5a. Forms of a Peltogaster. 6, 6a. Form of Crinoid. 7, 7a. Torpe to embryo and adult. 8, 8a. Embryo and adult Dog Fish.

groups. Man comes into the world as an infant, and bodily and mental development, operating by means of changes so gradual as to escape notice at the time, make that infant successively pass through childhood, youth, and so on to full maturity. Growth, still continuing, is now less apparent than before, and finally counter causes arrest and overcome it and induce decline.

Similarly, plants grow from seeds; the oak being ultimately produced by the acorn. Thus development is the law of the individual, both in the animal and in the vegetable kingdom. Among the several races of mankind there is a tendency toward progress from a less to a more civilized state, which again is development in another form. If it is manifested in the individual and in the human, if not even in all species, the inquiry, according to the upholders of this theory, is inevitable. May it not also operate in the various genera, families, orders, etc.? May not the more highly organized animals and plants have in some way been developed from the lower ones, and the time-honored view that species — each of them a separate creation — are so nearly constant that they can run only into varieties, require modification?

Buffon, in a vacillating way, believed in the transformation of species. Lamarck strongly contended for the same view, first publishing his opinions on the subject in 1801; stating them at greater length in 1809 in his 'Philosophie Zoölogique,' and in 1815, in the introduction to his 'Hist. Nat. des Animaux sans Vertèbres.' He maintained that all species, man himself not excluded, had descended from other species existing at a prior time. As early as 1795 Geoffroy Saint-Hilaire suspected that all known species are degenerations of one primitive type; he did not, however, publish his views till 1828. In 1844 appeared a work called 'Vestiges of the Natural History of Creation,' which by 1853 was in its 10th edition, and strongly advocated the development hypothesis. Many replies to this work were given, the most celebrated being Hugh Miller's 'Footprints of the Creator; or, the Asterolepis of Stromness.' The eminent metaphysician, Herbert Spencer, in an essay which appeared in the 'Leader' in March, 1852, and republished in his 'Essays' in 1858, contrasted the theories of special creation and development, and intimated his belief in the latter.

The last-named year began a new epoch in the history of the development hypothesis; 1 July 1858, a paper was read by Dr. Alfred Wallace, and another by Charles Darwin, on 'Natural Selection,' a modification of the development hypothesis, to which each had come independently; the former on observation and reflection while studying the natural history of the Malay Archipelago, the latter by a powerful and long-continued consideration of the phenomena of organic life which he had witnessed during his voyage round the world in the Beagle surveying vessel from 1832 to 1836. This is the form in which the development hypothesis now flourishes. Darwin's celebrated book, 'The Origin of Species,' first appeared in 1859, and his 'Descent of Man' in 1871. Dr. Wallace's work on 'Natural Selection' came out in 1870. One of the earliest converts to the new doctrines was Prof. Huxley, who has done an immense deal to defend them and render them popular. In Germany the same views are earnestly advocated and carried out to an extreme length by Prof. Haeckel in his 'History of Creation,' published in 1873, and of which an English translation appeared in 1875. What was formerly termed development, and sometimes more vaguely the transmutation of species, is now often called evolution. See DARWINIAN THEORY.

Dev'ens, Charles, American jurist and general: b. Charlestown, Mass., 4 April 1820; d. Boston, Mass., 7 Jan. 1891. He was educated at Harvard, and was United States marshal for the district of Massachusetts at the time when the case of Thomas Sims, a fugitive slave, attracted widespread attention. Devens delivered Sims to his master in accordance with the law, and afterward tried to purchase his freedom, but did not succeed till after the outbreak of the Civil War. He served in the Union army from 1861 to 1865, retiring with the full rank of brigadier-general and the brevet rank of major-general. In 1873 he was made associate justice of the Massachusetts supreme court; in 1877 became attorney-general of the United States; and in 1881 resumed his place on the Supreme bench of his native State.

Deventer, dā'vĕn-tĕr, or **Demter,** Holland, an old town in the province of Overyssel, eight miles north from Zutphen, on the navigable river Yssel. It has a large town-hall, a court-house, and prison, places of worship for Calvinists, Lutherans, Mennonites, Roman Catholics, and Jews. The Groote Kerk has a fine Gothic tower and a crypt dating from the end of the 11th century. The followers of Gerard Groot, or "the Brethren of the Life in Common," have their college here. Deventer is famed for its "honey-cakes," a kind of gingerbread.

De Vere, dẹ vēr, **Sir Aubrey Hunt,** Irish poet: b. Curragh Chase, Ire., 28 Aug. 1788; d. there 5 July 1840. His works are: 'Julian the Apostate: a Dramatic Poem' (1822); 'The Duke of Mercia: an Historical Drama,' the volume containing also 'The Lamentations of Ireland' (1823); 'The Song of Faith, Devout Exercises, and Sonnets' (1842); and 'Mary Tudor: an Historical Drama,' published posthumously (1847). His sonnets Wordsworth declared to be "the most perfect of our age."

De Vere, Aubrey Thomas, Irish poet and essayist: b. Curragh Chase, Ireland, 10 Jan. 1814; d. there 21 Jan. 1902. He was a son of Sir Aubrey De Vere (q.v.), and became a Roman Catholic in 1851. In 1842 his first volume of verse appeared, 'The Waldenses,' and 'The Search after Proserpine' (1843). His subsequent books of verse include: 'Poems, Miscellaneous and Sacred' (1853); 'May Carols' (1857); 'The Sisters' (1861); 'The Infant Bridal' (1864); 'Irish Odes' (1869); 'The Legends of St. Patrick' (1872) 'Alexander the Great' (1874); 'Legends of the Saxon Saints' (1879); 'The Foray of Queen Meave, and other Legends of Ireland's Heroic Age' (1882); 'Legends and Records of the Church and the Empire' (1887); and 'St. Peter's Chains' (1888). Among his prose works are: 'English Misrule and Irish Misdeeds' (1848); 'Picturesque Sketches of Greece and Turkey' (1850); 'Ireland's Church Property and the Right Use of It' (1867); 'The Church Establishment of Ireland' (1867); 'Constitutional and Unconstitutional Political Ac-

tion' (1881); 'Essays, Chiefly on Poetry' (1887); 'Essays, Chiefly Literary and Ethical' (1889); 'Recollections of Aubrey de Vere' (1897).

De Vere, Maximilian Schele, American philologist; b. near Wexio, Sweden, 1 Nov. 1820; d. 1898. He came to the United States in 1843; and in 1844 became professor of modern languages and belles-lettres in the University of Virginia. His works include: 'Outlines of Comparative Philology' (1853); 'Stray Leaves from the Book of Nature' (1856); 'Studies in English'; 'Glimpses of Europe in 1848'; 'Romance of American History'; 'Wonders of the Deep'; etc.

Dev'eron, a river of Scotland, in Aberdeenshire and Banffshire, which flows into the sea at Banff. It is about 50 miles long. The salmon-fishery is very valuable.

Devi, dā'vē, in Hindu mythology, "the goddess," or Mahadevi "the great goddess," wife of the God Shiva and daughter of Himavit (that is, the Himalaya Mountains). She is represented as a being of two characters, one gentle, the other fierce, and it is under the latter aspect that she is generally worshipped. In the Mahabharata she appears under many forms, and her individuality is fully developed in the Puranas.

Devia'tion, in the law of marine insurance, an unnecessary departure from the course of the voyage insured. The legitimate reasons for departure from the course are stress of weather, want of repairs, joining convoy, succoring ships in distress, danger from an enemy, sickness, and mutiny. Even in these cases the quickest courses must be taken. Deviation, from the moment at which it commences, discharges the underwriter from all liability.

Deviation of the Compass, the deviation of a ship's compass from the true magnetic meridian, caused by the proximity of iron. In wooden ships no magnetic deviation is perceptible so long as the ship is heading north or south. The greatest deviation is seen when the vessel heads east or west. In iron ships the magnetism is fixed by hammering and riveting, and the deviation manifests itself exactly in accordance with the point toward which the hull headed while these processes were going on. Armor-plated ships should be plated with their head in a different direction from that in which they lay when built. The mode now generally employed to correct deviation is by introducing on board ship masses of iron and magnets to exactly neutralize the action of the ship's magnetism. Compasses are sometimes carried on masts as a means of removing them from the disturbing influence of the iron of the hull. In this position they serve as standards of comparison for the binnacle compass. Wooden ships are also magnetized, so as to affect the compass, though in a far less degree, by the direction in which they lie when building.

Devil (O. E. deofol; O. S. diubal; O. H. G. tiufal; M. G. Teufel; Gothic, diabolus, from Gk. διάβολος, a slanderer), an evil spirit, Satan, the tempter, slanderer, and tormentor of human beings, according to the Scriptures of the Old and New Testaments. Most of the old religions of the East acknowledged a host of demons not good or bad, but merely exercising a salutary or injurious influence. In the latter case they were looked upon as punishing spirits, without inimical or wicked purpose. Siva, the judging and destroying god of the Indian mythology, is a symbol of the great power of nature, which is alternately beneficent and injurious, but in itself neither good nor evil. Zoroaster named this evil principle *Ahriman.* The Greek mythology did not distinguish with the same precision between the good and bad spirits. Beelzebub, or Beelzebul, appears to have been regarded by the Jews as the prince of the devils. According to the Mohammedans, who have derived their account from Jewish traditions, the devil, or, as they sometimes call him, *Eblis,* was an archangel, whom God employed to destroy the *jinns* or genii, a race intermediate between men and angels, who tenanted the earth before the creation of Adam.

The Satan ("adversary") of the New Testament is a rebel against God. Endowed with the intellect and power of angels, he uses them since his fall to entangle men in sin, and obtain power over them.

The doctrine of Scripture on this subject soon became blended with numerous fictions of human imagination, with the various superstitions of different countries, and the mythology of the pagans. The gods of the ancients became evil spirits, seeking every opportunity to injure mankind. The excited imaginations of people frequently led them to suppose Satan visibly present; and innumerable stories were told of his appearance, and his attributes distinctly described. The writings of the fathers of the Church also contain several passages respecting the appearance of the devil. In many works or appearances of an extraordinary character, the devil was supposed to be concerned. Thus, many a dam, bridge, etc., has been built in one night with his assistance, and everyone knows that superstitious writers of former days, applying the legends that had become connected with Dr. Faust, the reputed worker of magic, to Fust, to whom the invention of printing has frequently been ascribed, taught that he invented the art by the help of Satan.

Devil-fish, huge rays of the family *Mantidæ,* which have a lozenge-shaped disk broader than long, with the head free from the pectoral fins and provided with a pair of anterior processes, and the tail long and whip-like. The two genera and six or seven species are confined to warm seas. So far as known, the young are produced alive after the eggs have hatched within the oviduct. The best known species are *M. birostris,* sometimes called the blanket-fish by tropical American pearl-fishers, from their belief that it attacks and devours men after enveloping them in its great wing-like pectoral fins, which reach a breadth of 20 feet. It is common in tropical American waters, and occurs on both the Atlantic and Pacific coasts of the United States. The name also applies to the *Octopus* and allied eight-armed *Cephalopoda* (qq.v.).

Devil-worship, the worship paid to the devil as a malignant deity, or the personified evil principle in nature, by many of the primitive tribes of Asia, Africa, and America, under the assumption that the powers of evil are as mighty as the powers of good, and have in consequence to be conciliated. There is a sect

called Devil-worshippers, or Yezidees, inhabiting Turkish and Russian Armenia and the valley of the Tigris, and numbering more than 200,000. They venerate the authority of the Old Testament above that of either the New Testament or the Koran. They practise both infant baptism and circumcision, and have a religious ministry of four orders. Their Christian ideas have reached them through Gnosticism. They pay respect to the devil, to Christ, and to Allah or the supreme being, and also worship the sun.

Devil's Advocate. See ADVOCATE.

Devil's Arrows, three Druidical stone obelisks set up, probably as landmarks, near Boroughbridge, Yorkshire, England.

Devil's Bible, The, the popular name of a manuscript Bible written on ass-skin. The name arose from a legend that the writing was the work of a man who by the Devil's help accomplished it in a few hours in order to save his life, but who in return became the slave of the Evil One.

Devil's-bit, the common name of a species of scabious (*Scabiosa succisa*), of the natural order *Dipsaccæ*. It has nearly globular heads of blue flowers, ovate leaves, and a fleshy root, which is, as it were, cut or bitten off abruptly. In America devil's-bit is one of the common names of *Lacinaria spicata*, which is known as dense button snakeroot, gay feather, backache-root, colic-root, etc. It belongs to the *Compositæ*, and is found in moist soil from Massachusetts to Florida and westward to Wisconsin and Louisiana.

Devil's Bridge, (1) an ancient bridge in Cardiganshire, Wales; it crosses the ravine through which flows the Mynach. (2) A bridge in Switzerland, crossing the Reuss, on the road over St. Gothard, from Germany to Italy.

Devil's Coach-horse (*Oxypus oleus*), a common British and European beetle, belonging to the family *Staphylinidæ*. It has very much reduced wing-covers, and like many of its relatives has the habit of curving its body upward, to adjust the wings under their covers.

Devil's Darning-needle. See DRAGON-FLY.

Devil's Dyke, (1) an earthwork in Cambridgeshire, England, of prehistoric construction, about 20 feet in height. It is supposed to have been erected as a defense against enemies advancing from the Fen country. It extended from the fens, or marshes, to the wooded hills, and thus closed the only way of approach from the interior towns of England, and prevented raids upon whatever band of conquerors held the country near the sea. (2) A natural formation near Brighton, England. The old legend said this was the work of the "good spirits" who thus prevented the devil's attempt to flood the country because the people had abandoned paganism.

Devil's-finger, a name sometimes applied to the starfish (q.v.).

Devil's Island (ISLE DU DIABLE), a small rock formation off the coast of French Guiana, belonging to France. The area is about 16 square miles, and the island itself is sandy, dry, and torrid. Here Alfred Dreyfus was imprisoned for alleged treason.

Devil's Parliament, a nickname for an English parliament which met in 1459 at Coventry. The parliament was under the control of Henry VI., and at his instigation proscribed and attainted for treason the Duke of York and his adherents.

Devil's Punch-bowl, a lake of Ireland, near the summit of Mangerton Mountain, in the vicinity of the Lakes of Killarney. It is between 2,000 and 3,000 feet above the level of the sea, and is supposed to be the crater of an ancient volcano. It is about half a mile in length and fully one third in breadth.

Devil's Slide, a gorge of the Utah Mountains, formed wholly by the natural arrangement of parallel crags and resembling an inclined plane. The accidental juxtaposition of two such boulder masses, accounted for by the simultaneous action of a cooling atmosphere on liquefied masses, is a feature of Utah scenery.

Devil's Wall, an ancient fortification in the southern part of Germany, about 368 miles long. This wall was originally a Roman ditch, with palisades behind it. It was intended to protect the Roman settlements on the left bank of the Danube, and on the right bank of the Rhine, against the inroads of the Teutonic and other tribes. Remains of it are found at present only from Abensberg, in Bavaria, to Cologne. As to the time when this rampart was built our information is very scanty. Some parts of the northern Roman fortifications may be as old as the time of Drusus. The Decumat or Tithe Lands, however; that is, the lands to the east of the Rhine and north of the Danube, which the Roman emperors allowed immigrants to settle on, on condition of paying tithes to the state, do not appear to have had any protecting wall about 14 B.C. The main rampart, stretching southward from the Main to the Danube, was probably completed under Hadrian, and parts of it which had been destroyed seem to have been restored by Probus. All the parts of this great rampart are still far from being thoroughly investigated.

De Vinne, Theodore Low, American printer: b. Stamford, Conn., 25 Dec. 1828. He learned the printer's trade and became an employee and later partner of Francis Hart, upon whose death he founded the firm of Theodore L. De Vinne and Company in New York. He has written several works on typography, including 'Invention of Printing,' and 'Historic Types.'

Devise, dē-vīz', a gift of real property by a person's last will and testament. The term devise technically and properly only applies to real estate; the object of the devise must therefore be that kind of property. The word, however, is sometimes improperly applied to a bequest or legacy. In regard to a lapsed devise, where the devisee dies during the life of the testator, although there may be a residuary devisee, the estate will go to the heir. But if the devise be void, as where the devisee is dead at the date of the will, or is made upon a condition precedent, which never happens, the estate will go to the residuary devisee, if the language is sufficiently comprehensive (4 Kent Com., 541, 542, and cases cited in notes). But some of the cases hold in that case, even, the estate goes to the heir (4 Ired. Eq., N. C., 320; 6 Conn., 292). In England a residuary bequest operates upon all the personal estate which the testator is possessed of at the time of his death, and will include such as would have gone to pay specific legacies which lapse or are void. A general de-

vise of lands will pass a reversion in fee, even though the testator had other lands which will satisfy the words of the devise, and although it be very improbable that he had such reversion in mind. A general devise will pass leases for years, if the testator have no other real estate upon which the will may operate; but if he have both lands in fee and lands for years, a devise of all his lands and tenements will commonly pass only the lands in fee simple. But if a contrary intention appear from the will, it will prevail. A devise in a will can never be regarded as the execution of a power, unless that intention is clear, as where otherwise the will would have nothing on which it could operate. But to have that operation the devise need not necessarily refer to the power in express terms. But where there is an interest on which it can operate, it shall be referred to that, unless some other intention is obvious. The devise of all one's lands will not generally carry the interest of a mortgagee in premises, unless that intent is apparent. Devises are contingent or vested — that is, after the death of the testator; contingent when the vesting of any estate in the devisee is made to depend upon some future event, in which case if the event never occur, or until it does occur, no estate vests under the devise. But when the future event is referred to merely to determine the time at which the devisee shall come into the use of the estate, this does not hinder the vesting of the estate at the death of the testator.

Devizes, dē-vī'zĕz, England, a municipal borough in the county of Wilts, 82 miles southwest of London. The chief manufactures are steam-engines, boilers, gas-engines, and beer. Pop. 6,914.

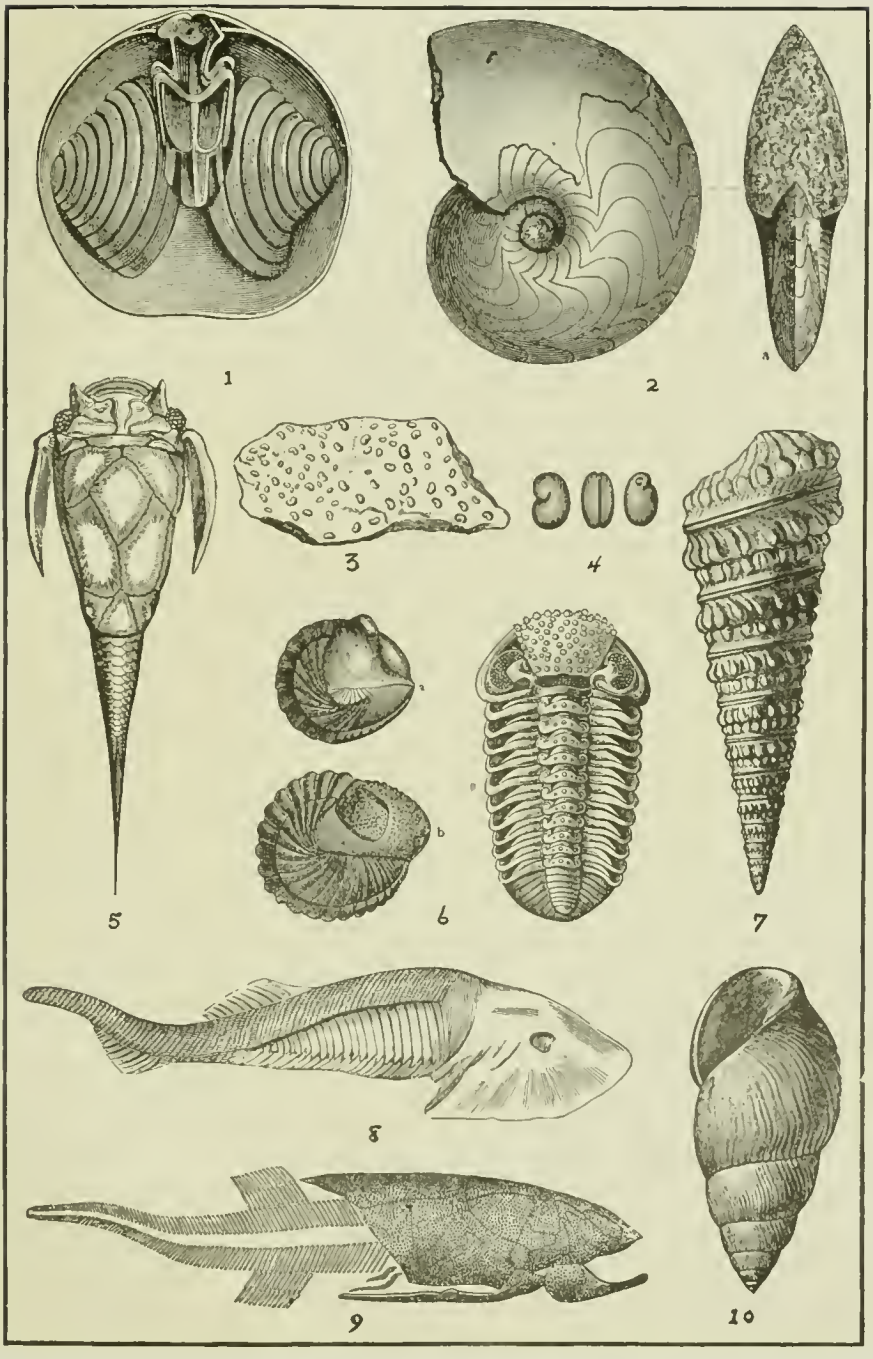
Dev'on, a river of Scotland, which has its source at the foot of the Ochill Hills, and flows into the Forth about two miles above Alloa. Its length is 34 miles. Below the Crook of Devon are a series of cascades, the most noted of which are the Caldron Linn and those at the Rumbling Bridge.

Devo'nian Period. In Devonian time, that part of Palæozoic time, following Silurian and preceding Carboniferous, North America was represented by a northern continental land mass and by an Appalachian land mass on the east, this Appalachian land having its western boundary where are the Blue Ridge Mountains, and extending as far south as Georgia; its eastern boundary, probably now covered by the Atlantic Ocean, may have been many miles from the present shore line. A continental land mass extended from the Hudson River westward, its shore line forming a great bay that covered central New York and part of Ontario, Ohio, and Michigan, and extending westward across Illinois, possibly connected with an uplift that reached from Wisconsin to South America. West of Wisconsin the Devonian land may have reached Montana. From northern Minnesota the continental shore line extended northwest to the Arctic Ocean in the neighborhood of the mouth of the Mackenzie River. The Gulf of St. Lawrence was much larger than now, and several long, narrow channels or sounds extended from it southwestward across New England and New Brunswick. There were islands along the line of the Cincinnati anticline in Ohio, Kentucky and Tennessee. There was a land area in eastern Colorado, another covering the area of the Black Hills in South Dakota, another in central Texas and there was a long narrow strip of land along the west side of what is now the great basin in Nevada and Utah.

In middle Devonian time Europe was largely covered by an open sea containing numerous islands, and most of Russia and Siberia and part of Central Asia were under water. In Scotland and Wales were landlocked seas or lakes, and there were others in western Russia. A large part of central South America was covered by water. Fossil evidence indicates that in early Devonian there were land connections between North and South America, and between South America and South Africa. The vegetable and animal life of Devonian time, so far as can be determined did not differ greatly from Silurian forms, though it shows a general advance toward more highly developed types. The land vegetation included cryptogams and Gymnosperms. Of the cryptogams the tree-ferns and the giant club-mosses (*Lepidodendra*) must have been conspicuous in the forests, being over 50 feet high. Of the gymnosperms, cycads, now almost extinct, were abundant, and it is possible that conifers of the yew family grew upon the higher ground.

Of animal life the trilobites, so abundant in Cambrian and Silurian time, were less important, but other crustaceans developed greatly, including the eurypterids, related to the horseshoe crabs, and decapods, or lobsters. Corals were very abundant in the Devonian oceans. Crinoids, or sea-lilies, and starfish were more abundant than in Silurian time. The brachiopods, or lamp-shells, apparently were, as in Silurian, the most abundant elements of marine life. Of mollusks, there were bivalves and gastropods; the ammonites appeared among the cephalopods, and nautilus-like forms were less abundant than in the Silurian. The chief characteristic of Devonian time, however, was the great development of the fishes, the Devonian being known as the "age of fishes." Many of the Devonian forms, however, have long been extinct, while the teleosts, which include by far the greater part of modern fishes, evidently did not exist at all in Devonian time. Among the odd Devonian forms were the ostracodermata, fish-like animals allied to the lampreys, but having the head and sometimes a large part of the body covered with bony plates. Of the true fishes the selachians, or sharks, were represented, as were the dipnoi or lung fishes, now almost extinct. The most highly developed Devonian fishes were the ganoids, now represented by the sturgeon and the gar-pike. See DEVONIAN SYSTEM; PALEOZOIC ERA.

Devonian System. The name Devonian appeared in geological literature in 1839, when Murchison and Sedgwick applied it to a rock system in Devonshire and Cornwall, England, consisting of conglomerates, shales and fossiliferous limestones lying below the carboniferous rocks and above the great mass of the graywacke or transitional series of Werner that was already included in the Cambrian or Silurian. Murchison and Sedgwick also included in the Devonian the old red sandstone of Scotland. In the United States, Hall of the New York Geological Survey, in an admirable report published in 1843, divided the Cambrian, Silurian,



1. A Brachiopod (Athyris concentrica), interior of dorsal valve, showing spiralia.
2. An Ammonite (Goniatites intumescens); a lateral view.
3. Hulls of fossil Entomostracans (Cypridida) in a slab of schist.
4. Shells of the same (Cypridina serratostriata).
5. An Armored Fish (Pterichthys cornuta).
6. A Trilobite (Phacops latifrons), shown in a and b rolled up.
7. A Gasteropod Mollusc (Murchisonia bigranulosa).
8. A Great Armored Fish (Cephalaspis lyelli); restored.
9. The Berry-bone Fish (Coccosteus decipiens); restored
10. A Gasteropod Mollusc (Macrocheilus subcostatus).

and Devonian systems of the Appalachian formations, and his work has needed little revision. The rocks of the Devonian System in North America are now subdivided into the Lower or Oriskany and Corniferous series, the Middle or Hamilton, and the Upper or Chemung. The Corniferous is subdivided into the Schoharie and Corniferous stages, the Hamilton into the Marcellus and Hamilton stages, and the Chemung into the Portage and Chemung stages. Where the line between the Silurian and Devonian systems should be drawn in North America is still a matter of dispute, the lower Helderberg formation of the Silurian being assigned to the Devonian by some European geologists. Of the stages named above, the Oriskany is a calcareous sandstone, covering eastern New York and extending south into Virginia, while on the west it extends into Ontario. It also outcrops in Illinois and in northern Alabama. It forms thick strata in Maine, and occurs in eastern Quebec. The Schoharie stage includes grits and fine conglomerates and having about the same distribution as the Oriskany. The Corniferous is a great limestone formation, largely made of corals, found in New York, Pennsylvania, Virginia, Ohio, Indiana, Illinois, Missouri and Iowa, also in Vermont and Quebec. The Hamilton series, which has about the same distribution as the Corniferous, is represented by a great thickness of shales and shaly standstones in New York and Ohio. It thins out southward and westward, and in Indiana, Illinois, Missouri and Iowa is represented by limestones. It is represented by sandstones and shales in eastern Quebec, and in New Brunswick and Nova Scotia. The Chemung series includes a thick shale and sandstone formation in New York, Ohio and Pennsylvania, but thins away rapidly to the westward. The flags, grits, shales, and sandstone of the Catskill group in New York are included for the most part in the Chemung. In Manitoba and the Northwest Territory, Canada, the Devonian System includes limestones and shales, and is of moderate thickness. There is an area of Devonian rocks extending along the Rocky Mountains from Montana across Alberta. In the United States the Devonian rocks of the Rocky Mountains appear in Colorado and Arizona. There are also ores in the Wasatch Mountains in Utah, in Nevada and in California.

In England and on the continent the Devonian System presents two different classes of rocks, (1) the Old Red Sandstone, occurring in Scotland, in South Wales and across the Welsh border in England, also in the Baltic provinces of Russia, and in Spitzbergen; and (2) the Marine Devonian, occurring in southwest England, in northern and southern France, in Spain, and over large areas in Germany and central Russia. The Old Red Sandstone was laid down in shallow seas either closed or having only slight connection with the open ocean. The formation is of interest from its containing remains of Devonian land animals and plants. The rocks are fine-grained conglomerates, sandstones, and shales. The Marine Devonian of Europe is largely limestone with some shales and slates.

Devonian rocks in Asia are found over a vast area in Siberia and also occur in China and in Asia Minor. In Africa they are found both in the northern and southern parts of the continent. In South America Devonian rocks form a great system, being found in Brazil, Bolivia, and the Falkland Islands. See CATSKILL GROUP; CHEMUNG STAGE; CORNIFEROUS STAGE; HAMILTON STAGE; MARCELLUS STAGE; PORTAGE STAGE; OLD RED SANDSTONE; ORISKANY STAGE.

See Zittel, 'History of Geology and Palæontology'; Dana, 'Manual of Geology'; Geikie, 'Text-book of Geology'; Leconte, 'Elements of Geology.'

Dev'onport (before 1824 called **Plymouth Dock**), England, a parliamentary and municipal borough, maritime town, and naval arsenal, in the southwest of Devonshire. It owes its existence to the dockyard established here by William III. in 1689, and is one of the chief naval arsenals in Great Britain.

Dev'ons, the name given to a breed of cattle which were first bred in Devonshire, England. They are rather wild, of a dark-red color, and can be used instead of horses for plowing. They are smaller than Shorthorns or Herefords. The bull has a small head, fine muzzle and face, very handsome horns, which should taper upward and rather backward; the eye is large and rather wild, indicating an active disposition; the neck is arched, but the dewlap is not much developed; tail set on rather high; good barrel well up behind the shoulder; not the depth of carcass in the same height as is found in the Shorthorns; skin of a dark-red and rather mottled character, and plenty of long curling hair; the skin is thicker than that of Shorthorns, but not so thick as that of Herefords. They form a good deal of inside fat and firm meat. The cows yield a very rich milk. They are hardy, and able to find food on poor uplands.

Dev'onshire, Spencer Compton Cavendish, 8TH DUKE OF, English statesman: b. 23 July 1833. He succeeded to the ducal title in 1891, having previously become well known by his courtesy title of the Marquis of Hartington. First returned to the House of Commons in 1857, he was appointed a lord of the admiralty in 1863, and secretary of state for war in 1866. He was postmaster-general under Gladstone 1868–71, and chief secretary for Ireland 1871–4. He was secretary for India 1880–82, and became secretary of state for war 1882–5. Since 1886 he has been recognized as an active and influential leader of the Liberal Unionists, and on the formation of a Unionist ministry in 1895 accepted the post as lord president of the council.

Devonshire, the third largest county in England, situated in the southwest. It is famous for its Old Red Sandstone (see DEVONIAN SYSTEM). This county contains the barren tract of Dartmoor and also the valley of the Exe, called "The Garden of Devonshire." For history, see ENGLAND.

Devrient, dĕv-rē-ănt, a family of German actors, of whom the most talented was LUDWIG DEVRIENT (1784–1832), distinguished both in comedy and in tragedy, and especially noteworthy as an exponent of Shakespearian characters. His nephew, CARL AUGUST (1797–1872), the eldest of the brothers Devrient, played lovers' parts and was the husband of the *diva*, Madame Schröder-Devrient (1805–60). PHILIPP EDUARD (1801–77), the second brother, was a delightful baritone singer in the early part of

the 19th century, and afterward became a painstaking, though not a great actor. He was the author of a number of plays, and of the valuable 'Geschichte der deutschen Schauspielkunst' (1848–74); and with his son Otto (1838–94) prepared an edition of Shakespeare. GUSTAV EMIL (1803–72), the youngest and most gifted of the three brothers, was most successful in tragic and emotional parts, and became identified in Germany with such characters as Hamlet, Tasso, and especially Posa.

De Vries, dē vrēs, **David Peterzen**, Dutch colonist in America. Nothing definite is known as to the dates of his birth and death. He was a member of a company organized in 1630 to settle the tract of land in the present State of Delaware, which had been bought in 1629 from the Dutch West India Company by Samuel Blommaert and Samuel Godyn. On his arrival 1632 he found that the colony founded 1631 on Lewes Creek, Cape Henlopen, and called with the surrounding country "Swaanendael," had been completely destroyed by the Indians. He left some of his party there and visited Virginia, but took the colonists back to Holland in 1634. Later he visited Manhattan several times and tried to found a colony on Staten Island, which the Indians destroyed in 1640. He also lived on a plantation called Vriessendael, on the site of Tappan, N. Y. Among his works is: 'Korte historiaal ende Journaels Aenteyckeninge van verscheyden Voyagien in der Vier Teelen des Wereldts Ronde'; 'A short history and notes of a journal kept during several voyages in the four parts of the world' (1655).

Dew, Thomas Roderic, American publicist: b. King and Queen County, Va., 5 Dec. 1802; d. Paris, France, 6 Aug. 1846. He was graduated from William and Mary College, and in 1827 was elected professor of political economy, history, and metaphysics in William and Mary College, and in 1836 was made president of that institution. In 1829 he published his 'Lectures on the Restrictive System.' It was brought out at a moment when feeling ran high on the subject of the tariff, between protectionists and free-traders; and though emanating from the closet of a thinker removed from the agitations of political warfare, took a strong hold on the public mind, and the subsequent adoption of the compromise of 1832 may be attributed in part to its silent influence. His most elaborate work was 'A Digest of the Laws, Customs, Manners, and Institutions of the Ancient and Modern Nations' (1853).

Dew, a deposition of water from the atmosphere upon the surface of the earth. During the day the earth both absorbs and emits heat, but after sunset its supply of warmth is cut off, while it still continues to radiate heat into the surrounding space. Grass, flowers, and foliage being good radiators, lose after sunset the heat which has previously been absorbed by them, without receiving any in return, and their temperature consequently falls considerably below that of the atmosphere. From the proximity of these cold substances the particles of vapor in the adjoining air are condensed and deposited upon their surfaces in the form of dew, or of hoarfrost where the temperature of the earth is below 32°. When the sky is clouded the heat abstracted from the earth's surface by radiation is restored by the clouds, which, being good radiators, transmit an equal amount of heat to what they receive; and a balance of temperature being thus maintained between the earth and the surrounding atmosphere, no dew is formed. The deposition of dew is likewise prevented by wind, which carries away the particles of air before the vapor contained in them has been condensed by the heat imparted by the adjoining radiating substances. Horizontal surfaces, and those which are exposed to a wide expanse of sky, receive a greater supply of dew than sheltered or oblique surfaces, where circumstances diminish the amount of radiation.

An acquaintance with the cause which produces dew and hoarfrost enables us to understand the rationale of the process resorted to by gardeners to protect tender plants from cold, which consists simply in spreading over them a thin mat or some flimsy substance. In this way the radiation of their heat to the heavens is prevented, or rather the heat which they emit is returned to them from the awning above, and they are preserved at a temperature considerably higher than that of the surrounding atmosphere. To insure the full advantage of this kind of protection from the chill of the air, the coverings should not touch the bodies they are intended to defend.

The radiation from the earth's surface is one of those happy provisions for the necessities of living beings with which nature everywhere abounds. The heavy dews which fall in tropical regions are in the highest degree beneficial to vegetation, which, but for this supply of moisture, would, in countries where scarcely any rain falls for months, be soon scorched and withered. But after the high temperature of the day the ground radiates under these clear skies with great rapidity, the surface is quickly cooled, and the watery vapor, which, from the great daily evaporation, exists in large quantities in the atmosphere, is deposited abundantly. This deposition is more plentiful also on plants, from their greater radiating power; while on hard, bare ground and stones, where it is less wanted, it is comparatively trifling. In cold climates the earth, being cold and sufficiently moist, requires little dew; accordingly the clouds, which are so common in damp and chilly regions, prevent the radiation of heat: the surface is thus preserved warm, and the deposition of dew is, in a great measure, prevented.

Dewas, dā-wās', India, (1) a native state in the Nimar and Malwa agency, consisting of two combined states with two chiefs; area 883 square miles. Grain, opium, sugarcane, and cotton are its chief productions. Pop. 152,073. (2) Dewas, the chief town, contains the residences of both chiefs, and near it, on a conical hill, is a temple. Pop. 15,100.

Dew'berry, *Rubus villosus*, or *Rubus canadensis*, a trailing plant of the natural order *Rosaceæ*. Its prickly stems, leaves, and fruit resemble the blackberry. During the last quarter of the 19th century it became popular as a cultivated fruit, principally through the introduction of its variety, the *Lucretia*, which is superior to the wild forms common as weeds on wornout pastures and poor land. The plants, which are propagated by means of stem-tips, do best on a rather lighter soil than the black-

berry, like which, with the exception of training, it is cultivated and fertilized. They are usually trained to stakes or trellises, and not given summer pruning, except in the removal of canes as soon as they have fruited. The usual distances for planting are three or four feet by six. The fruits ripen considerably in advance of the blackberries. See BLACKBERRY; RASPBERRY; RUBUS.

Dewdney, Edgar, Canadian statesman: b. Devonshire, England, 1835. He studied civil engineering, and on removing to Canada was employed to lay out the town of New Westminster. Though working at his profession for a number of years, he took an active interest in politics, was elected to the legislature of British Columbia in 1869, and in 1872 was elected to the Canadian Parliament, where he was one of the chief supporters of Sir John Macdonald of the Opposition. In 1871 he was appointed Indian Commissioner for the Northwest Territory, and in 1881 lieutenant-governor of the Territory, holding the two offices until 1888, when he became minister of the interior in the Canadian cabinet. In 1892 he was appointed lieutenant-governor of British Columbia.

Dewees', William Potts, American physician: b. Pottsgrove, Pa., 5 May 1768; d. Philadelphia 18 May 1841. He attended several courses of medical lectures at the University of Pennsylvania, and in 1793 began practice in Philadelphia. Here he achieved for himself a high reputation, especially in that department to which he devoted particular attention, midwifery, previously much neglected in America. He published 'Inaugural Essays'; 'System of Midwifery,' of which latter many editions have been printed'; 'A Treatise on the Physical and Medical Treatment of Children'; 'A Treatise on Diseases of Females'; 'Practice of Medicine' (1830). In 1826 he was elected adjunct professor, and in 1834 professor of obstetrics and diseases of women and children in the University of Pennsylvania.

De Wet, dā-vĕt', **Christiaan,** Boer general: b. Dewetsdorf, Orange Free State (now Orange River State), about 1860. He was bred a farmer, made a small fortune, and became a member of the Volksraad. Though practically without military experience, he served ably in the Boer-British War of 1899–1900, attaining the rank of general and outwitting the pursuit of Kitchener and Roberts in the summer of 1900, and of the former in the early part of 1901. His stand at Sanna's Post was highly praised by military experts. He was especially noted for his humane treatment of prisoners of war. His 'Three Years of War' was published in 1902.

De Wette, dĕ vĕt'tĕ, **Wilhelm Martin Leberecht,** German theologian: b. Ulla, near Weimar, January 1780; d. Basel, Switzerland, 16 June 1849. In 1807 he became professor of theology at Heidelberg, and in 1810 he was called to be the colleague of Schleiermacher at Berlin. In 1822 he accepted the chair of theology at Basel, where he remained till his death. The influence of De Wette's views upon the theological tendencies of his time was most important. He was remarkable for his critical acuteness, and for his powers of concise and clear exposition. His works are very numerous. Among them are: 'Beiträge zur Einleitung in das Alte Testament' (1806–7); 'Lehrbuch der historisch-kritischen Einleitung in die kanonischen und apokryphischen Bücher des Alten Testaments' (1817); 'Einleitung in das Neue Testament' (1826); 'Lehrbuch der hebräisch-jüdischen Archäologie' (1814); 'Kurzgefasstes exegetisches Handbuch zum Neuen Testament' (1836–48). These works are all more or less of a critical nature; in the following he developed his own theological views: 'Lehrbuch der christlichen Dogmatik' (1813–16); 'Christliche Sittenlehre' (1819); and the didactic novel, 'Theodor oder des Zweiflers Weihe' ('Theodore, or the Consecration of the Sceptic,' 1822).

Dewey, Chester, American educator: b. Sheffield, Mass., 25 Oct. 1784; d. Rochester, N. Y., 15 Dec. 1867. He was graduated at Williams College in 1806, where, in 1810, he became professor of mathematics and natural philosophy, a post he held 17 years. In 1836 he was appointed principal of the Collegiate Institute in Rochester, N. Y., and in 1850 became professor of chemistry and natural philosophy in the University of Rochester, resigning 10 years later. He was an authority on grasses. He wrote 'History of the Herbaceous Plants of Massachusetts,' and valuable papers on botany.

Dewey, Davis Richard, American political economist and statistician: b. Burlington, Vt., 7 April 1858. He is a brother of John Dewey (q.v.). He was educated at the University of Vermont, and at Johns Hopkins University. He is professor of economics and statistics in the Massachusetts Institute of Technology, and secretary of the American Statistical Association. His works are: 'Syllabus of Political History Since 1815'; 'Report of Massachusetts Board to Investigate the Subject of the Unemployed' (1895); 'Report of Commission to Investigate the Public Charitable and Reformatory Interests and Institutions of the Commonwealth' (1897); 'Financial History of the United States' (1902).

Dewey, George, American naval officer: b. Montpelier, Vt., 26 Dec. 1837. At 17, after a preparatory course in the Northfield Military School, young Dewey was appointed a cadet at Annapolis, in the class which was graduated in 1858. At the outbreak of the Civil War he was commissioned a lieutenant under Admiral Farragut and assigned to the sloop-of-war Mississippi. His first active experience in war was when the West Gulf squadron, early in 1862, forced a passage up the Mississippi River ahead of Farragut. A later enterprise resulted in the grounding of the Mississippi, in the middle of the night, while attempting to run the batteries of Port Hudson. Here she was riddled with shot and set afire by the enemy's batteries, so that officers and crew had to abandon her, and make their way as best they could to the other shore before the flames reached her magazine and she exploded.

Other notable engagements in which Dewey figured during the Civil War were at Donaldsonville in 1863, and at Fort Fisher in the winter of 1864–5, as an officer of the Agawam. Receiving his commission as lieutenant-commander in March 1865, he served for two years on the Kearsarge and the Colorado, and was then attached to the Naval Academy for two years more. In 1870 he was given command of the Narragansett, and during his five years' charge

of her rose to be a commander. He was then attached to the Lighthouse Board, and in 1882 took his next sea duty in command of the Juniata of the Asiatic squadron. On reaching his captaincy, in 1884, he took charge of the Dolphin, one of the first vessels of the new navy. From 1885 to 1888 he commanded the Pensacola, then flagship of the European squadron; and this service was followed by shore duty, in the course of which he served as chief of the Bureau of Equipment at the Navy Department, and afterward on the Lighthouse Board for a second time. In 1890 he was promoted to commodore, and made president of the Board of Inspection and Survey. At the beginning of 1898, a few weeks before the outbreak of the Spanish-American war, he was placed in command of the Asiatic squadron, and was thus given the chance to distinguish himself which he so brilliantly improved.

With his squadron he left Mirs Bay, China, 27 April 1898, with orders to "capture or destroy the Spanish squadron," then supposed to be in Manila Bay, under command of Admiral Montojo. The squadron entered the channel of Manila at 11:30 P.M., Saturday, 30 April, and early on Sunday morning, 1 May, sank, burned or captured all the ships of the Spanish squadron in the bay, silenced and destroyed three land batteries, obtained complete control of the bay, so that he could take the city, the chief port of the Philippine Islands, at any time, and all without losing a single man, and having only nine slightly wounded. On 18 August Dewey and his ships aided Gen. Merritt in the capture of Manila. In recognition of his Manila Bay achievement, Commodore Dewey received the thanks of Congress, which awarded to him a magnificent sword, and medals to his men. As a further recognition of his achievement, Commodore Dewey was (7 May 1898) promoted to be a rear-admiral, and subsequently (3 March 1899) made admiral of the navy under an act of Congress, approved 2 March 1899, restoring that rank for the especial purpose of enabling the country to honor adequately the hero of Manila Bay. In 1901 he was president of the Schley court of inquiry, and in 1902 was appointed commander-in-chief of the united squadrons and fleets mobilized for extraordinary manœuvres. Consult Clemen's 'Life of Dewey' (1899).

Dewey, John, American psychologist: b. Burlington, Vt., 20 Oct. 1859. He was educated at the University of Vermont and has been professor of philosophy at the University of Chicago from 1884, and editor of the 'Elementary School Record.' Among his works are: 'Psychology'; 'Leibnitz's New Essays Concerning Human Understanding'; 'Critical Theory o Ethics' (1891); 'Study of Ethics.'

Dewey, Melvil, American educator and librarian: b. Adams Centre, N. Y., 10 Dec. 1851. He was graduated from Amherst College in 1874; was college librarian during his senior year and for two years after graduation. He then went to Boston where he was active in founding the American Library Association, the Library Bureaus, the Metric Bureau for introducing the metric system, and the Spelling Reform Association. He was the founder and for five years the editor of the 'Library Journal' and also editor of 'Library Notes' and the 'Spelling Reform Bulletin.' In 1883 he was appointed librarian at Columbia, and in 1887 established the school of library economy, of which he was made director. In 1889 he became secretary of the University of the State of New York, and director of the State library, the library school being at that time transferred to Albany; in 1891 he became director of the home education department, and organized the system of traveling libraries. In New York State he has accomplished much in the raising of school standards, and particularly in the improvement and founding of small public libraries. He has also had much influence on library work in the United States; has twice been president of the American Library Association, and its secretary for 15 years; he devised the decimal system for the classification of books which is widely used, and published a set of cataloguing rules, included in his 'Library School Rules.' He has also published a revision of the laws of New York State in regard to education (1892), and the 'Decimal Classification and Relative Index' (1885).

Dewey, Orville, D.D., American Unitarian clergyman: b. Sheffield, Mass., 28 March 1794; d. there 21 March 1882. He was graduated at Williams College in 1814, and pursued his divinity studies at Andover Theological Seminary 1816–19; but became a Unitarian and soon after an assistant of Dr. Channing. He was pastor of the Unitarian Church in New Bedford 1823–33, and of the 2nd Unitarian Church in New York 1835–48. He published: 'The Old World and the New' (1836); 'Letters on Revivals'; 'Discourses on Human Nature'; 'Discourses on Human Life'; 'Discourses on the Nature of Religion'; 'Discourses on Commerce and Business'; 'Miscellaneous and Occasional Discourses'; 'The Unitarian Belief'; 'Discourses and Reviews.'

De Windt, de wint, **Harry,** English explorer: b. Paris, France, April 1856. He was educated at Cambridge, and after serving as aide-de-camp to his brother-in-law, Rajah Brooke of Sarawak, 1876–8; went from Peking to Paris by land 1887; visited mines and prisons in Siberia 1890–4; explored the Klondike 1897, and went from Paris to New York by land for the London *Daily Express* 1901–2. He has written: 'On the Equator' (1882); 'From Pekin to Calais by Land' (1887); 'A Ride to India' (1890); 'Ennui de Voyage,' poems (1890); 'Siberia as it Is' (1892); 'The New Siberia' (1895); 'A Queer Honeymoon,' a novel; 'Through the Gold Fields of Alaska to Bering Strait' (1898); 'True Tales of Travel and Adventure' (1899); 'Finland as it Is' (1901).

Dewing, Thomas Wilmer, American figure and portrait painter: b. Boston 4 May 1851. He was a pupil of Boulanger and Lefèbvre and is an academician of the National Academy of Design 1888, and a member of the Society of American Artists. Among his pictures are: 'Prelude'; 'The Days,' which took the Clarke prize in 1887, and 'The Garden.'

De Wint, Peter, English landscape painter in water-colors: b. Stone, in Staffordshire 21 Jan. 1784; d. London 30 June 1849. He studied in the schools of the Royal Academy, where he occasionally exhibited; but most of his pictures were shown in the exhibitions of the Water-color Society. English scenery was his



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ADMIRAL GEORGE DEWEY.

favorite subject. He occasionally painted in oil with marked success. Some of his best pictures are: 'A Corn-field'; 'Woody Landscape with Water'; 'Lincoln Cathedral'; and 'Harvest-time.'

De Witt, Jan, yän dĕ vĭt, Dutch statesman: b. Dort 1625 or 1632; d. The Hague 20 Aug. 1672. He became the leader of the political party opposed to the Prince of Orange, and in 1652, two years after the death of William II., was made grand pensionary. In 1665 the war with England was renewed and conducted by De Witt with great ability till its termination in 1665. In 1672 Louis XIV. invaded the Spanish Netherlands and involved Holland in war. De Witt's popularity, already on the decline, suffered still further in the troubles thus occasioned, and he felt it necessary to resign his office of grand pensionary. At this time his brother Cornelius, who had been tried and put to torture for conspiring against the life of the young Prince of Orange, lay in prison. Jan de Witt went to visit him, when a tumult suddenly arose among the people, and both brothers were murdered. De Witt was a man of high character, simple and modest in all his relations.

Dewitt, John, American Dutch Reformed clergyman: b. Albany, N. Y., 29 Nov. 1821. He was graduated at Rutgers College in 1838, and at New Brunswick, N. J., Theological Seminary in 1842. He was pastor of several churches 1842–63, and professor of Oriental literature and of Hellenistic Greek at the New Brunswick Theological Seminary 1884–91. He has been a member of the American Testament Revision Committee since 1872. Among his works are: 'The Sure Foundation'; 'Praise Songs of Israel'; 'The Psalms,' a new translation; and 'What is Inspiration?'

Dewitt, John, American Presbyterian theologian: b. Harrisburg, Pa., 10 Oct. 1842. He graduated at Princeton 1861; took up the study of theology at Princeton Theological Seminary and at Union Theological Seminary, New York, and was ordained to the ministry in 1865. He has been pastor of several churches, professor of ecclesiastical history Lane Seminary, Cincinnati, 1882–8, and professor in McCormick Theological Seminary, Chicago, 1888–92. He has published 'Sermons on the Christian Life.'

De Worms, Henry, 1st Baron Pirbright, English statesman and writer: b. 1840; d. London 10 Jan. 1903. He was educated at King's College, London, was admitted a barrister of the Inner Temple in 1863, and sat in the House of Commons for Greenwich 1880–5, and for Tox-teth 1885–95. He was under-secretary of the colonies 1888–92. He published 'England's Policy in the East'; 'The Earth and its Mechanism'; 'The Austro-Hungarian Empire'; 'Memoirs of Count Beust.'

Dewsbury, England, a municipal and parliamentary borough in the West Riding of Yorkshire; 30 miles southwest of the town of York; on the Calder. Coal is mined, but the trade of the town is chiefly in heavy woolen cloths, including blankets, carpets, flannels, and worsteds. It has manufactories for fancy cloths and shoddy goods, contains iron and boiler works. Pop. of municipal borough 29,637; of parliamentary borough 74,349.

Dexter, Henry, American merchant: b. West Cambridge (now Arlington), Mass., 14 March 1813. He early established a connection with publishing firms in Boston and Cambridge, which was continued until 1836. He then went into the hardware business, remaining in this until 1842, when he took up the wholesale trade in books, periodicals and newspapers. He organized the American News Company in 1864, serving as president.

Dexter, Henry Martyn, American Congregational clergyman: b. Plympton, Mass., 13 Nov. 1821; d. New Bedford, Mass., 13 Nov. 1890. He was graduated at Yale 1840, and at Andover Theological Seminary 1844. He filled a pulpit in Manchester, N. H., 1844–9, and was pastor of Berkeley Street Church, Boston, 1849–67. He was one of the editors of the 'Congregational Quarterly' from 1859 to 1865, becoming editor-in-chief of the 'Congregationalist' 1867. He was a staunch defender of the Congregational polity and delighted in controversy. His principal works are: 'The Voice of the Bible and the Verdict of Reason' (1858); 'Congregationalism: What it Is, Whence it Is, How it Works, Why it is Better than Any Other Form of Church Government, and its Consequent Demands' (1865); 'Roger Williams and His Banishment From the Massachusetts Colony' (1876); 'The Congregationalism of the Last Three Hundred Years' (1881); 'Common Sense as to Woman Suffrage' (1885); 'Early English Exiles in Amsterdam' (1890).

Dexter, Samuel, American statesman and jurist: b. Boston 14 May 1761; d. Athens, N. Y., 4 May 1816. He was graduated at Harvard University 1781; was admitted to the bar in 1784. He was repeatedly chosen to the legislature of Massachusetts, and in 1798 was elected senator of the United States. While senator he was appointed secretary of war in 1800, and in the same year secretary of the treasury. He was afterward, at different times, offered foreign missions, but always refused them. About the year 1802 he withdrew from political life, and returned to his profession. He was an unsuccessful candidate for governor in 1814. He was the first president of the first society formed in Massachusetts for the promotion of temperance.

Dexter, Timothy, American merchant: b. Malden, Mass., 22 Jan. 1743; d. Newburyport 22 Oct. 1806. He succeeded in amassing a large fortune for those days. He developed certain eccentricities which gave him great notoriety, assuming the title of Lord Timothy Dexter. For example, he constructed odd and bizarre residences in Newburyport, Mass., and Chester, N. H. The grounds of the first house were adorned with thirty or forty colossal wooden statues of famous men. He included himself in the number. He also made an extraordinary collection of absolutely worthless paintings, in order to prove his knowledge of art, and supported a poet who was supposed to be ready to sing his praises upon occasions. He wrote a book called 'A Pickle for the Knowing Ones' and also a pamphlet with all the punctuation marks printed upon the last page, there being none in the text proper.

Dex'trin ($C_6H_{10}O_5$), a body obtained from starch, and very similar to it in composition; also called starch gum, British gum, etc. It resembles gum in being soluble in water, but is distinguished from that substance by composition, by being, like starch, converted into oxalic

acid by nitric acid, and not into mucic acid, and especially by causing a ray of polarized light to deviate to the right, a property from which it derives its name. It is prepared from starch by several processes. The transformation may be effected by dilute sulphuric acid at a temperature a little below that of boiling water. By acting upon starch with diastase (q.v.) dextrin is produced. To water at about 70° or 80° F., in a boiler, 8 or 10 parts of dried malt are added, and then 100 parts of starch after the heat is raised to 140° F. The mixture is kept stirred and the temperature maintained somewhat above this for 20 minutes, and then, when the thick mass has become quite fluid, it is raised to the boiling-point rapidly, cooled, the clear liquor filtered, and evaporated to a syrup. When cold it is an opaque gelatinous mass, which, on drying, becomes hard like gum. Dextrin is used in large quantities for thickening calico-printers' colors, for making adhesive paper and labels, and for postage stamps, as a varnish, and for many other purposes.

Dextrose, dĕks'trōs, grape-sugar, starch-sugar, or dextroglucose, $C_6H_{12}O_6$ or $C_6H_7O(OH)_5$. Dextrose occurs along with levulose in grapes and other sweet fruits, also in honey and in the urine of diabetic patients. It can be produced by the action of dilute sulphuric acid on cane-sugar, starch, cellulose, etc. It can be best obtained by boiling for several hours 50 parts of starch with dilute sulphuric acid (100 parts of water to 5 parts of H_2SO_4). The solution is then neutralized with chalk, filtered, boiled with animal charcoal to remove traces of color, and then evaporated carefully to dryness, forming an amorphous mass which contains about 60 per cent of dextrose, the remainder being chiefly dextrin. Pure dextrose can be obtained by crystallization from alcohol; it contains then one molecule of water of crystallization, and forms microscopic rhombic crystals, which soften at 60°, melt at 86°, and lose their water crystallization at 110°. Heated to 170° it is converted into glucosan ($C_6H_{10}O_5$). Dextrose tastes much less sweet than ordinary cane-sugar. By the action of sodium amalgam on dextrose it is converted into mannite, $C_6H_{14}O_6$. A solution of dextrose becomes brown when boiled with caustic alkalies.

Dey, dā (from Turk. day, maternal uncle, a title of dignity), a title formerly given in the 17th century to the Turkish commander of the army in Algiers. The office was attained by seniority. When the French captured Algiers in 1830, the title and office were of course abolished. The title of dey as given to the governor of Tunis has long been replaced by that of bey. There still exists a dey of Tripoli.

De Young, Michael Harry, American publisher; b. St. Louis, Mo., 5 Oct. 1848. He received a common school education and in 1865 established with his father the 'Dramatic Chronicle,' subsequently merged into the San Francisco *Chronicle*, of which he has been sole proprietor since 1880. He was commissioner from California to the Paris Exposition of 1889, vice-president of the World's Columbian National Commission in 1892, and director-general of the California Midwinter Exposition of 1893. In the last named year he was made vice-chairman of the Republican National Committee.

Dhalak, dä-läk', an archipelago of the Red Sea, off the coast of Abyssinia. It contains nearly 100 rocks and islets, mostly uninhabited, clustering round the island of Dhalak-el-Kebir. This island possesses a pearl fishery.

Dhar, där, India, (1) a small native state in the Malwa agency, in the central part of India, with an area of about 1,740 square miles. The soil is fertile, and yields rice and other cereals. Pop. 109,474. (2) The capital, of the same name, is situated about 180 miles east of Baroda, and contains some striking buildings, and a fort built of red stone stands outside the town. Pop. 18,430.

Dharangaon, där-äṇ'gä-ôn, India, city in the Khandesh district, Bombay, having a trade in cotton and oil-seeds, and manufactures of coarse cloth. Pop. 15,072.

Dharwar, där'wär, India, city, capital of a district of the same name, in the southern Mahratta country, in Bombay presidency. The city is a trade and dispensing station for the surrounding country. American cotton is raised successfully, and silk and cotton goods are manufactured in the district. Pop. 32,841.

Dhawlagiri, dą-wäl''ä-ghėr'ē, or **Dhaulagiri,** once supposed to be the highest peak of the Himalayas, has a height of 26,826 feet above the sea. It is in Nepal, in lat. 29° N., and lon. 82° 30' E.

Dhole, dōl, a local Indian name for the wild dog, native to parts of India. It is called "buansu" in the Himalayas. See *Wild Dogs,* under Dogs.

Dholera, dō'lėr ą, India, city in the Ahmedabad district of Bombay presidency, on a stream entering the Gulf of Cambay, an important cotton mart. Pop. 10,088.

Dholka, dōl'ka, India, city in the Ahmedabad district of Bombay presidency, probably one of the oldest towns in Gujerat. The weaving of women's robes is the principal industry of the town. Pop. 16,494.

Dhow, dow, an Arab sea-going vessel, ranging from 150 to 200 tons burden, with one mast, a yard the length of the vessel, and a large lateen or triangular sail. It is used for merchandise and is often employed in carrying slaves from the east coast of Africa to Arabia.

Dhulia, doo'lē-ä, India, the chief town of Khandesh district, Bombay presidency, situated on the south bank of the Panjhra River. There is a new and old town combined. It is a cantonment town. Pop. 21,880.

Dhurra, door'ra, or **Dourah,** Indian millet, the seed of *Sorghum vulgare*, after wheat the chief cereal crop of the Mediterranean region, and largely used in those countries by the laboring classes for food. Varieties are grown in many parts of Africa, one of them known as Kaffir-corn.

Di'abase, a word used by petrographers with varied meanings; but the present usage in this country restricts it to crystalline igneous rocks, of the basalt family, generally occurring as dikes, having as essential constituents plagioclase feldspar, augite and magnetite. Olivene may or may not be present. Diabases differ from the

granitoid rocks, to which they have a somewhat similar texture, in that the crystals of feldspar are long and narrow, or lath-shaped, and the dark silicates are arranged in the interstices of the felspar crystals, giving an ophitic texture. Diabases are of common occurrence in the United States. They form dikes and laccoliths at various places along the Atlantic seaboard from Nova Scotia to Georgia. The so-called traps of the Connecticut valley and the Palisades of the Hudson, are familiar examples. In the Lake Superior country diabases are of frequent occurrence; notably in the Marquette Iron Range and on Keweenaw Point; the latter sometimes carry native copper. The convenient field name greenstone, is frequently given to old, more or less altered, diabases. By pressure and shearing stresses, and the intrusion of other igneous rocks, diabases change to hornblende and chlorite schists, showing no trace of original structure. Such rocks are common in the Lake Superior region and elsewhere, along the Algonkian and Archæan rocks that characterize the formation of so much of northeastern North America. Diabases are of common occurrence in the Rocky Mountains also, and frequently, over deposits, are found along their contacts with sedimentary rocks, particularly limestones. The typical diabase of the Palisades contains: SiO_2 53.13; Al_2O_3 13.74; Fe_2O_3 1.08; Fe O 9.10; Ca O 9.47; Mg O 8.58; Na_2O 2.30; K_2O 1.03. The specific gravity is 2.96.

Diabetes (dī-ą-bē'tēz) **Insip'idus**, a chronic disorder, characterized by the production of large quantities of urine of low specific gravity. It is a disorder particularly of young people, and is more frequent in males than in females. In the larger number of patients it seems to be of congenital origin. Its exact nature is unknown, although it seems to be related to some disturbance of the vasomotor mechanism in the kidneys. As a rule it is a disease of slow onset, the early symptoms being an increasing thirst and the passage of large quantities of urine. Occasionally there are pains in the thighs; the appetite is usually good; there is much thirst; the perspiration is small in amount, and the skin is apt to be rough and harsh. Otherwise the patients suffer but very little. It is a disease that is rarely prejudicial to health, having been known to persist for 50 years, and occasionally it passes away without treatment. Treatment is unsatisfactory.

Diabetes Mel'litus, a disorder of nutrition, in which there is deficient oxidation of the sugar in the body, which permits of the storing up of large amounts of sugar in the blood. This is eliminated in part in the urine, and there constitutes one of the most positive findings of the condition. It is a rare disease in America, but is less so in European countries, where it is from three to five times as common as here, although statistics seem to show that it is on the increase in the United States. The symptoms vary very widely. There is an acute form of the disease which proves rapidly fatal, but in the majority of cases there is a gradual onset, during which increased urination and increased thirst are the initial symptoms. Following this, if the disease progresses, the thirst still increases; there is passing of large quantities of urine containing glucose; very marked increase in the appetite, amounting sometimes almost to voraciousness and gluttony; and an accompanying progressive emaciation. The skin is dry and harsh; temperature is often below normal; the tongue is bright red, and glazed; the gums may be swollen; and constipation is the rule.

As the disease progresses a number of complications are apt to arise; boils and pimples are extremely common; eczema and intense itching are frequent. Perforating ulcer of the foot may occur, and occasionally there is bronzing of the skin. Acute pneumonia is a frequent cause of death. Gangrene of the lung may also arise, and tuberculosis is contracted with great readiness. In most cases, particularly in the young, there is a form of progressive intoxication due to the gradual retention in the body of acids which are not properly neutralized by the body's protective agencies. There is gradually progressive anæmia, headache, delirium, great distress and marked hunger for air, which may be accompanied by blueness of the skin. Neuralgic pains are also frequent complications in diabetes.

The cause of diabetes mellitus is a matter of much inquiry, but it would seem that it is a disease of a number of origins. Fundamentally, however, it is due as implied at the beginning of this article, to some interference with the physiology of sugar-oxidation. This may result from disease of the pancreas, disease of the suprarenal gland, sometimes disease of the central nervous system, and occasionally disorder of the sympathetic system. The pancreas and the suprarenals are considered at the present time as the site of the chief changes leading to the production of this disease. The outcome is usually dark. In children, as a rule, it progresses rapidly to death. Middle-aged people may live for many years, but instances of cure in true diabetes are rare. The treatment is largely hygienic, and is extremely complicated. Diet and hygiene are the most important factors. Each patient having his idiosyncrasies, medical advice on the matter of diet is imperative. The patient, not the disease, needs treatment; hence general rules are more productive of harm than of good.

Diabet'ic Sugar ($C_6H_{12}O_6$), formerly supposed to be a distinct species of sugar, now found to be the same as glucose (q.v.). It is regularly produced by the liver, and is a constant though trifling constituent of healthy urine, but in diabetes mellitus (q.v.) it amounts to 8 or 10 per cent. See INOSITE.

Diablerets, dē-ä-blē-rā', **Les** (Fr. "the little devils"), a secondary mountain group of the Bernese Alps, Switzerland, between the canton Vaud and canton Valais. The highest peak is 10,620 feet. Two peaks have already fallen, and others threaten to follow. The rocks consist of limestone, resting at a high angle on beds of shale, which becoming disintegrated leaves the limestone without support, and causes tremendous landslips. The most disastrous took place in 1714 and 1749. By the former the surrounding district was shaken as by an earthquake, and many human beings and cattle perished; by the latter the course of the Liserne was arrested, and two small lakes formed.

Diacaustic (dī-ą-kâs'tīk) **Curve**, a curve of intense light, formed by the consecutive intersections of rays refracted through a lens,

Diachylon, dī-ăk'ī-lŏn, a combination of oxide of lead or litharge, olive oil, and water. It is, in fact lead soap, insoluble in water, and sparingly soluble in alcohol, hard and brittle when cold, but soft on heating. It is used in surgery as the basis of adhesive plasters.

Diadem, a band for holding together the adjusted hair of the head, a wreath or chaplet for the head or forehead. In Oriental antiquity it was employed as a badge of royalty or nobility among the Egyptians, Assyrians and Babylonians. It was called *nezer* among the ancient Jews, and was worn as an ornament by kings and high priests, when it took the form of a golden circlet for the brows. Among the Persians, Armenians, and Parthians, the kingly and queenly diadem was a broad band of pale blue. Alexander the Great adopted this regal decoration after contact with the Persians, and his successors followed his example in this fashion. The Greeks early adorned their greater gods with the diadem, notably Zeus, Hera and Aphrodite, and it later became the universal ornament of their women, and their young men, especially the Olympic victors. These diadems were made of such various materials as metal and leather. Among the Romans Ancus Martius introduced the diadem from the Etruscans, but it was abolished on the expulsion of the kings. Which of the Cæsars revived its use is not known. According to some authorities Aurelian first assumed it. Its use among the non-Roman kings and princes of Europe appears to have been universal. Under Constantine the Great the imperial diadem was studded with gems and took a form which rendered it the prototype of the crowns worn by mediæval and modern monarchs.

Diæresis, dī-ĕr'e-sĭs, in grammar, the resolution or separation into distinct syllables of two vowels whose juxtaposition has either caused them to coalesce or threatened them with coalition. In printing, a mark (¨) placed over the second of two adjacent vowels to indicate that they should both be pronounced: as, aërated.

Diagno'sis (Gr. from *dia*, through, and *gnōsis*, knowledge), in medicine, the discrimination of diseases. It includes the study of all the vital phenomena of diseases, and also of their appearances after death, in so far as this can aid their discovery during the life of a patient. It is usual to speak of rational or physiological diagnosis, or diagnosis by symptoms, that is, changes chiefly functional, observed by the patient; and of physical diagnosis, or diagnosis by signs, that is, objective phenomena appreciable by the senses of the observer. The latter method of diagnosis has been much enlarged in scope and increased in importance by the modern methods in medicine of auscultation and percussion (qq.v.) and also by the great advances made in physiological chemistry, and by the use of the microscope. Skill in diagnosis is one of the highest gifts of the physician.

Diag'onal, Diagonal Line, a straight line joining two angles not adjacent, in a rectilinear figure. Every rectilinear figure of more than three sides may be divided by diagonals that do not intersect, into as many triangles as it has sides, minus two. To find the number of possible diagonals, take three from the number of the sides, multiply the remainder by the number of the sides, and halve the product.

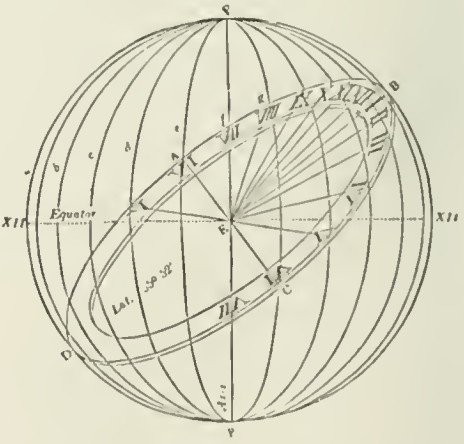
Diagoras (dī-ăg'ō-ras) **of Melos,** Greek philosopher, d. Corinth about 412 B.C. He was a pupil of Democritus of Abdera. On account of his ridiculing the popular religion, he was charged with impiety, and received the surname of the Atheist. Fearing for his life, he fled from Athens and went to Pallene, and finally to Corinth.

Diagram, a figure or geometrical delineation applied to the illustration or solution of geometrical problems, or a description or sketch in general. Anciently, it signified a musical scale. Among the Gnostics the name diagram was given to a figure formed by the superposition of one triangle on another, and inscribed with some mystical name of the Deity, and worn as an amulet.

Dial, The, a famous American quarterly, the recognized organ of the Transcendentalists. It was published in Boston 1840–4. Its first editor was Margaret Fuller, 1840-2, assisted by George Ripley and Emerson, and for the remainder of its course it was edited by Emerson. It was reissued in 1902 with introduction by G. W. Cooke.

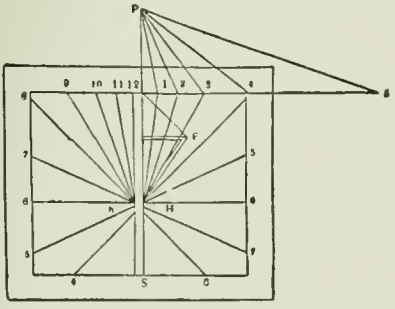
Dial, Sun, an hour-measuring instrument known from the earliest times to the Egyptians, the Chaldæans, and the Hebrews. The Greeks derived it from their eastern neighbors, and it was introduced into Rome during the first Punic war. The leading principles of dialing may be made intelligible to general readers by the following simple illustration.

Let P B *p* D represent the earth as a hollow transparent sphere, having an axis P E *p*, of



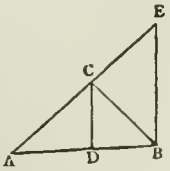
which P and *p* are the poles. Let the equator be divided into 24 equal parts, and through these divisions draw the meridians, *a*, *b*, *c*, *d*, etc. Let one of these meridians pass through any given place for which a dial is required to be made, and where that meridian cuts the equator let it be numbered XII. The opposite meridian must likewise be numbered XII, the other meridians being numbered as shown in the cut. This being done, these meridians will be the hour circles of the place on the first meridian; so that if the axis P E *p* were opaque, the sun

in his (apparent) motion round the earth in 24 hours will pass from one meridian to another in one hour, and cause the shadow of the axis to fall on the hour on the plane D C B A. This diagram has been drawn for the latitude of Glasgow, 55° 52′, and the plane in its present position would form a horizontal dial for that place; but we may suppose it capable of moving round its axis A C, so as to assume different



positions in the sphere. If it move round so as to become vertical, that is, at right angles to its position in the figure, we then obtain an erect south dial. The plane may also be made to incline from the meridian either toward the east or west. Thus we have dials of different kinds dependent on the position of the plane with regard to the first meridian, the position of the hour lines of which are all determined by the meridians of the sphere cutting the plane.

We have been considering the earth as the sphere, in our illustration of the nature of dials, but the earth's magnitude is so small compared with the distance of the sun, that no sensible error will follow in considering a small glass sphere similar to that above described, but placed on the surface of the earth with its axis parallel to that of the earth; then will the sphere show the hour of the day in the manner before specified. The only things absolutely essential for a dial are the axis and the plane, the places of the hour lines having been once determined. Dials may have various forms, many of which are exceedingly curious and intricate, and require for their construction the application of complicated trigonometrical formulæ. We shall confine our attention here to the most common, and, at the same time, most useful form, that is, the plane horizontal dial. On the proposed plane, which may be either of marble, slate, or brass, draw the straight line P H S for the meridian or 12 o'clock line, and parallel to this draw 12, h S, leaving a space between them equal to the thickness of the gnomon. The gnomon is a thin triangular plate of metal, somewhat similar in shape to the figure A E B, the side A B being fixed into the plate of the dial, so that the gnomon shall stand perpendicularly, the line A E being directly north and south. The line A E is called the style, and the angle E A B is equal to the latitude of the place for which the dial is constructed.



We return again to the consideration of Fig. 2. Draw 6 H 6 perpendicular to 12 H S, and it will be the 6 o'clock hour line; make the angle 12 H F equal to the latitude of place, and draw 12 F perpendicular to H F; continue S 12 to P, making 12 P equal to 12 F. The line 12 1 2 3 4 is drawn parallel to the line 6 H 6. From the point P draw the lines P 1, P 2, P 3, etc., terminating in the line 12 1 2 3 4, making angles with the line 12 P at the point P of 15°, 30°, 45°, etc., increasing by 15 degrees each line. Next from the centre H draw the lines H 1, H 2, H 3, etc., and thus the hour lines of 1, 2, 3, 4, and 5 P. M. will be found. The hour lines on the other side of the style should now be formed by taking a tracing of the side already formed; the hours are of course numbered differently, and both sides will stand thus, the hour line of both sides corresponding:

$$12, \begin{matrix} 1, & 2, & 3, & 4, & 5, & 6, & 7, & 8, \\ 11, & 10, & 9, & 8, & 7, & 6, & 5, & 4. \end{matrix}$$

Here we have carried the hours beyond 6, which was the extent of the construction; but to find the hour lines for 4 and 5 in the morning we have only to produce the hour lines of 4 and 5 in the evening, and in like manner for the hour lines of 7 and 8 in the afternoon, produce the hour lines of 7 and 8 in the morning. The dial gives solar time, and, therefore, the time, according to it, will only agree four days in the year with a well-regulated clock. See EQUATION OF TIME.

The sun-dial is daily getting more rare in this age; but notwithstanding the superiority of the clock, why has the dial almost everywhere vanished? "If its business use," as has been well observed, "be superseded by more elaborate inventions, its moral use, its beauty, might have pleaded for its continuance. It spoke of moderate labors — of pleasures not protracted after sunset — of temperance and good hours. It was the primitive clock — the horologe of the first world. Adam could scarce have missed it in paradise. It was the measure appropriated for sweet plants and flowers to spring by — for the birds to apportion their silver warblings by — for flocks to pasture and be led to fold by. The shepherd carved it out quaintly in the sun, and, turning philosopher by the very occupation, provided it with mottoes more touching than tombstones."*

Dialect, a local variation of language. The common meaning of the term dialect, in modern times, is the language of a part of a country, or a distant colony, deviating either in its grammar, words, or pronunciation, from the language of that part of the common country whose idiom has been adopted as the literary language, and the medium of intercourse between well educated people. In ancient times, when the great difficulties in the way of intercourse and communication between different parts of a country prevented, or at least impeded, the formation of a general language, each dialect was developed independently of the others, until some event gave to one the ascendency. In Greece we find four distinct dialects: the Ionic, Attic, Doric, and Æolic, each of which gave birth to literary productions still extant, until at last the greater refinement, and the cultivation of arts and sciences in Athens, gave the Attic dialect the superiority.

Although the use of provincial dialects becomes inconvenient after a language has

* "*Horos non numero nisi serenas*" ("I only count the hours of sunshine") was an ancient dial-motto of great beauty and significance.

acquired a fixed literary standard, the study of such dialects is always valuable to the philologist for the light they throw on the history of the language.

Italian was once the vulgar dialect; and, even now, to translate into Italian is called *volgarizzare*. It was corrupt Latin mixed with barbarous words derived from the idioms of the conquerors of the country, and was used at first only by the lower classes; it then became the general dialect of common life; and at last Dante dared to adopt the "vulgar dialect," and to stamp it as a legitimate language.

Spanish and Portuguese were cognate dialects, and might, like the different dialects of the Spanish provinces, have become one language, if the two nations had not been separated politically.

In Germany no dialect has ever attained entire ascendency. Charles V., born at Ghent, spoke Low-German; but Luther's translation of the Bible, like Dante's 'Divina Commedia,' made High-German the literary language. Only the fundamental characteristics of the language of Upper Germany have remained in High-German.

Of English there are but two distinct literary dialects, the modern English and the Scottish, which is derived from the same Saxon stock. It has often been observed, however, that no country has more variations from the common literary language. The Scottish dialect exists in its purity only in the early poets, historians, and other writers of the country. Every county has its peculiarities, which are sometimes striking and difficult to be understood. It is evident that, although there never has existed a country so vast, and a population so large, as that of America, with so little variety of dialect, the work of development and decay is palpably going on in American Anglo-Saxon. To begin with, the dialect of the French Canadian is vivid and picturesque. That there are several distinct dialects in the United States is proved not only by the dialect literature of the East, the West, and the South, and dialect of the slums in New York, but also by the scientific publications of the American Dialect Society. The 'Dialect Notes' of this society furnish much valuable information on this subject, and 'The Ithaca Dialect,' in which a local New York State dialect has been investigated by O. F. Emerson shows that the differentiations of language in distinct sections will some day furnish abundant and interesting material for the student of dialect.

Dialectic, the art of separating a subject into its parts by discussion. It thus includes both the use of reason and speech, and is the process of defining an idea or principle and testing the definition by showing all the consequences, both positive and negative, that it involves.

Aristotle is reported to have said that Zeno the Eleatic was the father of dialectic. The justification of this remark is found in the fact that Zeno defends the position of his school by showing through a process of reasoning the absurd and contradictory results that follow from the conceptions defended by their opponents. With Socrates dialectic is an art of investigating a subject by means of conversation carried on by two or more persons, each of whom contributes something to the result, proposing definitions, or calling attention to certain aspects of the subject, or certain negative cases that had been overlooked. Thus Xenophon ('Memorabilia,' Chap. v.) tells us that Socrates said that dialectic was so called because it is an inquiry pursued by persons who take counsel together, separating the subjects considered according to their kinds. Plato extends the use of the term and makes it the art of working up by a methodological procedure of thought to a knowledge of the highest principles of things. As he says ('Republic,' bk. v.), it is the method by which "reason avails itself of hypotheses not as first principles, but as genuine hypotheses, that is, as stepping-stones and helps whereby it may force its way up to something not hypothetical and arrive at the first principles of all things and seize it in its grasp." For Plato then dialectic is the term used to describe all logical thinking. Aristotle, however, does not use the term to cover his art of logical demonstration from necessary principles, but ascribes to it a lower place, describing it as the method of dealing with what is merely probable, or of arriving at what is most likely to be true in cases when certain demonstration is impossible.

The term dialectic has also frequently been used both in ancient and modern times to denote an empty or sophistical art of playing with words or operating with concepts that have no real meaning or content. Thus Kant in the 'Critique of Pure Reason' employs the word in this sense to denote "the false pretense of knowledge that is based on illegitimate concepts that have no real basis in experience." He names the third main division of his work 'Transcendental Dialectic,' and devotes it to a systematic exposure of the emptiness and futility of this form of reasoning. Hegel, on the other hand, uses the term to describe the true method of the development of thought. According to him there is in thought an internal principle of development in virtue of which it moves through three stages — from a thesis or positive position to the antithesis or negative view that is contradictory of the starting-point, then finally to the synthesis or reconciliation of the two opposing views. Hegel develops this into a universal method of procedure, regarding it as a process that exhibits both the development of the thought-process and also the nature of reality, and pointing out illustrations of its course in history and in many departments of life and thought.

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Di'alogue, a conversation or conference between two or more persons. The dialogues of Plato are a sort of philosophical drama. The Socratic dialogue consists of questions and answers, and the person questioned is obliged, by successively assenting to the interrogatories put to him, to come to the conclusions which the questioner wishes to produce. The Socratic method has been adopted in modern times as a means of instruction in certain schools. Lucian claimed to be the inventor of humorous dialogue (see Dialogues of the Dead). Erasmus of Rotterdam, and subsequently, among the Germans, Lessing, Moses, Mendelssohn, Engel, Herder, Jacobi, Solger, have written in this form. In comic and satiric dialogue Wieland has imitated Lucian. Among the most distinguished Italian

writers of dialogue are Petrarch ('De vera sapientia'), Machiavelli, Gelli, Algarotti, and Gozzi; and among the French, Sarrasin, Malebranche, Fénlon, and Fontenelle. Among the English, Bishop Berkeley and Hurd have imitated Plato, and Harris, Cicero. Lord Lyttelton's 'Dialogues of the Dead,' and Addison's 'Dialogues on Medals,' are well known, but Landor's 'Imaginary Conversations' is the finest production in English belonging to this class of works. In the drama, the dialogue, in a narrower sense, is opposed to monologue or soliloquy; in the opera, it is that which is spoken, in opposition to that which is sung.

Dialogues of the Dead, satirical dialogues by Lucian (q.v.), written at Athens during the latter half of the 2d century. They have been frequently translated from the days of Erasmus to the present. The scene is laid in Hades. Among the characters introduced or referred to are: Menippus and Diogenes, the Sophists, and the Cynics, Aristotle, Alexander, Socrates, and Crœsus. The decadent Olympian religion is exposed to ridicule, and it is demonstrated that the conception of fate logically destroys moral responsibility. In the dialogue regarding Charon and his passengers, the futility of riches and fame is shown, only sterling moral qualities availing in the shadowy land of Hades. Lord Lyttelton also wrote 'Dialogues of the Dead,' introducing some modern *dramatis personæ*, including Cortez, William Penn, Ximenes, Wolsey, Boileau, and Pope; and Fontenelle's 'Dialogues des Morts' should be noted as embodying a similar idea.

Dial'ysis, the separation of the crystalloid constituent elements of a mixture from the colloid, the former being bodies which diffuse readily, such as sugar, salt, bichromate of potassium, etc.; the latter bodies which diffuse with difficulty or not at all, bodies resembling glue or gelatin, such as gum, starch, caramel, albumen, the ordinary constituents of food, etc. The dialysis is effected by pouring a mixed solution of crystalloid and colloid on a sheet of parchment paper stretched over a wood or gutta-percha hoop, having its edges well drawn up, and confined by an outer rim. The parchment is allowed to float on a basin of water. In a short time all the crystalloid bodies will have passed through the membranous septum into the pure water, while the colloid matter will remain almost entirely in the dialyzer.

Diamag'netism, the moving of bodies such as iron, when placed in a field of magnetic force, from places of weaker to places of stronger force. The opposite is true of bismuth and other substances. Such substances are said to be diamagnetic. See MAGNETISM.

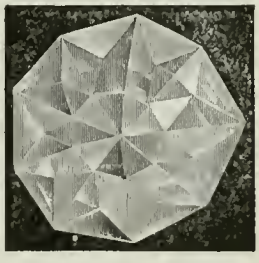
Diamantina, Brazil, a city lying somewhat north of the centre of the state of Minas Geraes, in a region formerly well known on account of its abundant production of diamonds. At the present time the wealth of the state is derived from agricultural and manufacturing industries; nevertheless Diamantina continues to prosper, being well situated with reference to the São Francisco River system, and the routes of travel between Rio de Janeiro and the interior. Its climate is good, owing to its elevation above sea-level (about 4,000 feet). Pop. (1901) 14,000.

Diam'eter, a straight line drawn through the centre of a circle, and terminated both ways by the circumference. It thus divides the circle into two equal parts, and is the greatest chord. The radius is half this diameter, and consequently measures the distance between the centre and circumference of a circle. The length of the diameter is to the length of the circumference of the circle as 1 is to 3.14159265 . . ., the latter number being an interminable decimal.

Diamond, a natural form of carbon, highly valued as a precious stone when transparent and of the crystalline form. It is of less value than the ruby, and rubies of from two to four carats are frequently worth twice or four times the value of fine diamonds. A diamond crystallizes in the cubic or monometric system, its common form being the regular octahedron or a modification of it. The faces are often curved and the general form of the crystal is more or less rounded. The surface of the diamond frequently exhibits striæ and triangular impressions, while the interior may contain microscopic cavities and various inclusions, often black carbon. It is the hardest substance known, but in spite of this hardness it is very brittle and cleavable; specific gravity, 3.52. It is generally colorless, but sometimes tinged with pink, red, orange, yellow, green, blue, brown, or black. Blue, red, and green are exceedingly rare colors. The finest deep red diamond known is that in the possession of the Russian crown, purchased in the time of the Emperor Paul of Russia. Light yellow, straw, and brown are the most common colors; rich yellow and browns are also highly prized. Some bluish-white Brazilian diamonds are phosphorescent in the dark after exposure to the sunlight. The color is attributed to the presence of a possible hydrocarbon, called Tiffanyite. This phosphorescence is a property peculiar also to alizarin. The brilliancy of the gem is caused by the black planes reflecting all the light that strikes them at an angle exceeding 24° 13′. The index of refraction is 2.439, being exceeded only by that in chromate of lead and orpiment. The diamond is unaffected by any liquid and infusible at the highest attainable temperature. It gradually burns away before the oxy-hydrogen blowpipe, or in the electric furnace, or when it is heated red-hot and plunged into an atmosphere of oxygen, carbonic acid then being produced. Exposed to the intense heat of the voltaic arc, the diamond becomes converted into graphite. Be-



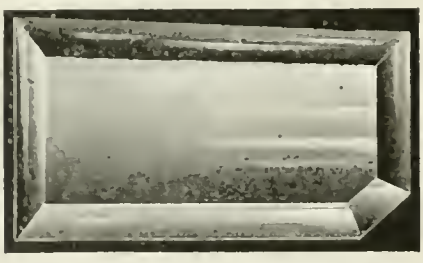
Natural Crystal.



Florentine Crystal.

sides its value as a gem it is of great use in the arts and manufactures. Diamond dust is used for cutting and polishing other gems, for slicing gems of all kinds, agate, jade, and other hard substances. The edge of a native crystal rounded is used by glaziers for cutting glass, for engraving glass, steel, and other substances; the cut is generally to a depth of only 1-100 of an inch, but determines the direction in which the glass shall break; a cut of this depth, while scarcely showing, breaks well, whereas a deep scratch does not. A sharp point is used for engraving on glass and other hard substances; a splinter is also used as a tool for turning glass lenses in a lathe; and rough diamonds, too imperfect to be used as gems, are mounted as boring tools for perforating the softer rocks. In the amorphous black variety, carbon, carbonado, or bort is used for boring hard rocks; it sells for $30 a carat, the value per carat of a fine transparent rough diamond of from one to two carats, as scarcely 33⅓ to 40 per cent of the crystals is left in the gem after the operation of cutting.

Originally diamonds were preserved in their natural form, but in 1456 Louis de Berguin or Bruges discovered the art of polishing them on rotating disks with diamond dust. These circular disks, about 10 centimetres in diameter, are of soft steel covered with diamond dust and oil, and made to revolve at 3,000 revo-



Great Table Stone of India.

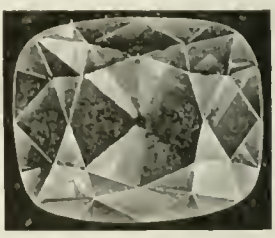
lutions a minute. This gives the diamonds the artistic smooth surfaces and sharply defined edges. They are secured in a fusible metal dop or holder, held by a metal clamp to the wheel. The process is slow and tedious, and requires great skill to produce fine results. Until a few years ago Amsterdam was the great diamond-cutting centre of the world, but the finest cutting is now done in the United States, and in a great measure by machinery. As to the cutting process: Diamonds are, first, cleaved; that is, along the line of cleavage of the stone a tiny cut is made by rubbing the stone with another diamond at the point where it is desired to cleave it, then a dull knife-edge is placed in the cut, and a sharp blow will separate the stone on a cleavage plane. Secondly, diamonds are cut by rubbing two diamonds together ("diamond cut diamond," as the old adage says), the stones being cemented with shellac to two pieces of wood or handles which are held in the hands, and rubbed together till they are of the desired form. This also has been superseded partly by an American machine. The diamond-cutting trade is carried on by 8,000 jewelers, and over 30,000 people are employed in preparing and setting the gems. A "rose" diamond is one which is quite flat underneath, with its upper part cut into 12 or more little faces or facets, usually triangles, the uppermost of which terminates in a point. A "table" diamond is one which has a large rectangular face on the top, surrounded by four lesser rectangles. A "brilliant" diamond is one which is cut in faces both at top and bottom, and the table or principal face of which is flat; there are 32 faces on the top above the girdle, and 24 on the back, exclusive of the table on the top and the inlet on the back, 58 in all. The greatest amount of brilliancy and beauty is developed in the diamond by the "brilliant cut"; 98 per cent of all modern cut diamonds are cut in this form. Very few are at present "rose cut" or "table cut," though rose cut has been more or less in vogue from the 17th century; table cut was in vogue during the 15th and 16th centuries. The finest brilliant in the world to-day is the "Jubilee" diamond, shown at the Paris Exposition of 1900; this was a brilliant of 239 carats of wonderful brilliancy and purity, and was found at the Jagersfontein mine in South Africa.



The Shah.

Diamonds of from 1 to 22 carats each have been found in 24 localities in the United States. The combustibility of diamonds was proved in 1694 by Averani and Targioni with the aid of burning glasses. That diamonds turned to carbonic acid when burned was proved by Lavoisier in 1772. Many curious superstitions are connected with the diamond. It was supposed to show phenomena of sympathy and antipathy. It was fallaciously believed that the diamond, which resisted the two most powerful things in nature, iron and fire, might be destroyed by the blood of a goat; that, if it was macerated in fresh blood, it could not be destroyed by being struck on an anvil, etc. It was believed also to show a curious rivalry with the magnet, to strengthen poisons, and sometimes to drive away madness.

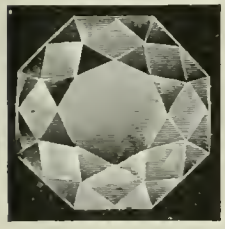
That the diamond was known to the ancients is extremely problematical. Only two diamonds are mentioned by Castellani as existing in antiquity in a small gold statue, and even this allusion is doubtful. Therefore we may safely say that when the Prophet Jeremiah speaks of diamonds under the name of shamir as a tool for engraving; when Ezekiel and Zechariah compare the stubbornness of the Israelites to the diamond, and when the Greeks and Romans speak of the stone under the name of adamas or adamant, the "unsubduable," the stone referred to was really the corundum. There does not exist in a single antiquarian collection in Europe a stone of the mineral which we now call diamond; the earliest authentic specimen known



Star of the South.

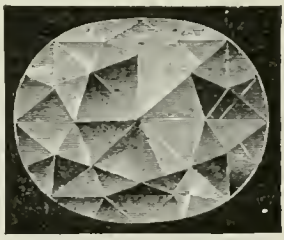
being the stone set in the ring of Charlemagne, an octahedral diamond. Any other reference can only mean the corundum or sapphire, the stones which are next in hardness to the diamond, and which could both have been used for engraving nearly all the gems of the time. Pliny mentions this stone as being the most valuable of the possessions of man.

Authors and composers of Eastern tales long wrote of diamonds as being found in India only, and chiefly in the mines of Golconda — a misnomer, as Golconda was the market, not the mine; and diamonds from many mines were sold there. But ever since the year 1728 these stones have been found in great abundance in Brazil, no less than 1,146 ounces having been taken from there to Europe in 1730. In 1829 a vein of diamonds was discovered in the Ural Mountains; and in 1867, in South Africa, John O'Reilly, a trader and hunter, reached the junction of two rivers, and stopped for the night at the house of a farmer named Van Niekerk. Children were playing with some pebbles they had found in the river. O'Reilly took one of these pebbles to Dr. Atherstone at Cape Town, who said that it was a diamond of 22½ carats. It was sold for $3,000. Niekerk remembered that he had seen an immense stone in the hands of a Kaffir witch-doctor, who used it in his incantations. He found the man, gave him 500 sheep, horses, and nearly all he possessed for the stone, and sold it the same day to an experienced diamond buyer for $56,000. This was the famous "Star" of South Africa. It weighed 84½ carats in the rough, and was found to be a gem quite the rival of an Indian stone in purity and brilliancy. After it had been cut it was bought by the Earl of Dudley, and is now known as the Dudley diamond. By 1869, parties in ox-wagons had worked their way over the plains to the Vaal River. Soon a tented city of 12,000 or more foreigners grew at Pniel and Klipdrift, on the opposite banks of the stream, where diamonds were found plentifully. Soon hundreds of cradles, like those used by the Australian gold-diggers, were rocking on the edge of the stream, supplied with the precious gravel by a large force of diggers, sievers and carriers. The mines at Kimberley, 600 miles from Cape Town, are of exceeding value, the richest in the world. The output of a single mine, the "Kimberley," is $4,000,000 annually, and within 10 years this district has yielded about $58,000,000 in dividends. Ninety-five per cent of all the diamonds produced in the past 20 years came from South Africa; of these over 90 per cent came from the De Beers mines, limited, a consolidation of all the African mines in and about Kimberley; 5 per cent from the Orange River Colony and elsewhere, the latter usually of great purity. The capitalization of the De Beers mines is at the present market value about $100,000,000.

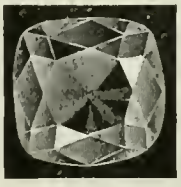


The Pasha of Egypt.

Most of the miners are natives, who are kept in compounds for periods of from three to six months; this system has broken up the illicit diamond buyers' ("I. D. B.") system, which seriously threatened the successful working of the mines. The chairman of this syndicate was Cecil J. Rhodes (q.v.), who by his genius and will created the corporation apparently out of chaos, and regulated the value of diamonds for over 12 years, the result being of great benefit to the jewelers of the world. The buying and selling of the gems is controlled by the government. Since the organization of the De Beers mine, in 1888 to 1 Jan. 1900 there have been mined 35,000,000 loads of earth of 1,600 pounds each; these have yielded 31,000,000 carats of diamonds, valued at $200,000,000. The total African yield from the opening of the mines to the present is about $350,000,000, after cutting $700,000,000 worth of diamonds. Since 1867, duty has been paid on $240,000,000 worth of diamonds and precious stones, and it may be safely said that $500,000,000 worth are owned in the United States.



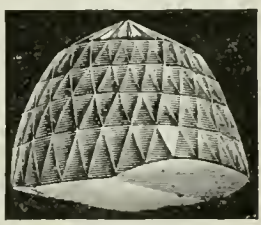
The Kohinur.



The Polar Star.

The total value of all the diamonds known to exist in the world to-day is at least $1,000,000,000. Therefore it may safely be said that one half of all the diamonds known are owned in the United States.

Most of the great diamonds distinguished for beauty and size have very interesting histories. One of the most famous is the Kohinûr, or Koohinoor, "Mountain of Light." The legend is that it was carried 5,000 years ago by the hero Karna, whose deeds are celebrated in the "Mahabharata." It made its first appearance in history in the 14th century, when Ala-ed-din brought it to Delhi. At that time it was supposed to weigh 793 carats. When in 1673 the Grand Mogul sold it to Tavernier, it weighed only 279 carats, having been injured by the lack of skill of a Venetian lapidary. It was brought in 1739 at the sack of Delhi to Afghanistan. Thence it came into the possession of the East India Company, which presented it in 1850 to the English crown. It was recut in 1852 and now weighs 106 1-16 carats.



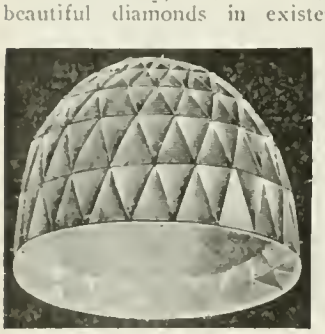
The Orloff.

What is said to be the largest stone in the world was sent to London from the Jagersfontein mines in South Africa in 1893. It weighed 971 carats or nearly half a pound, and was three inches in length. It is in process of being cut in Amsterdam, and is of a fine color. Another

weighed 640 carats. A pre-historic diamond mine is believed to have been discovered near Winburg in the Orange River Colony, a hundred feet in depth and with tunnels branching off for several hundred feet. In these were found primitive tools, armor and weapons, and the skeletons of men who must have been above the average stature of any race of the present day. The natives have no traditions concerning them.

Another important diamond is the one at the point of the sceptre of the Russian empire, known as the Orloff, which weighs 194¾ carats. At one time it formed the eye of an idol in the temple of Seringham in Mysore, whence it was stolen. It was in the throne of Nadir Shah, and after his murder it was bought by an Armenian merchant in 1772 at the price of 450,000 silver rubles and the title of nobility. By the gift of Prince Orloff, a favorite of Catharine II., from whom it derived its name, it came into her possession. Some writers think that this and the Koh-i-Nür are the two parts of the "great mogul" diamond. The supposed great diamond of the king of Portugal, 1,770 carats, is a rolled oval pebble of white topaz.

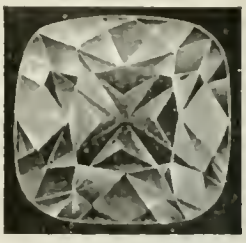
The Regent or Pitt diamond was, till the recent opening of the South African mines, for over a century, one of the most perfect and beautiful diamonds in existence. It weighs 136.75 carats, and is of the purest water and most perfect shape. It came from the East Indies and was sold by a sailor to Pitt, governor of Ft. St. George. From him it came into the hands of the Duke of Orleans at the time of the French revolution. It was in pawn at the hands of a merchant by the name of Trescow. Afterward it decorated the sword hilt of Napoleon I., and is now in the Galerie d'Apollon in the Louvre.



The Great Mogul.

One of the finest of diamonds is the Sancy diamond, 53½ carats, of exquisite shape and perfect water. It has been traced back to Charles the Bold, who lost it in 1477 at the battle of Nancy. It came through many private hands to the Huguenot nobleman Sancy. When Sancy was sent as an ambassador to Solothurn, he received from Henri III. the command to send to him that diamond as a pledge. The servant to whom it was entrusted was attacked and murdered, but instead of giving up the diamond he swallowed it. Sancy had the body opened and found the precious diamond in his stomach. James II. procured it when he came to France in 1688. Later it came into the possession of Louis XIV. and was worn by Louis XV. at his coronation. In 1835 it was sold to the Russian emperor for 500,000 rubles. In 1865 it came into the hands of Sir Jamsetjee Jeejeebhoy, and in 1889 was again in the market; the price asked was 100,000 rubles. It is owned by a collector, who paid $70,000 for it.

One of the most superb diamonds known is the sapphire-blue brilliant Hope diamond, valued at about $100,000. It is believed to have been cut from a blue diamond weighing in the rough 112½ carats, sold by Tavernier to Louis XIV., and which disappeared in the troubles of 1792. The largest diamond ever found in Brazil weighed 254½ carats, and was discovered in 1853 by a negress in the river Bogageno; it is known as the "Star of the South." It was sold to the Gaekwar of Baroda for $450,000.



The Regent or Pitt.

From 1750 to 1870 the value of a diamond was fixed on a basis of the square of its weight; that is, a 1-carat stone was worth $100, a 10-carat stone was worth — 10 x 10 x 100 — $10,000. This was due to the fact that large stones were rare. But in the African mines, large stones are found, and the increase in value from one carat up is worth only a fraction more per carat than the carat weight would show. When brilliants are exceedingly small the value per carat may be double that of stones weighing one sixteenth to one fourth carat each, owing to the difficulty of cutting. The term "first quality" signifies a stone absolutely white and free from all flaws and imperfections. Imperfections, even if slight, or a tint of undesirable colors, greatly lower the value of a diamond.

As the diamond is known to be nothing but a crystalline form of common carbon, many attempts have been made to manufacture it by artificial means. No great degree of success has yet rewarded these efforts, although very small diamonds of apparently good quality can be prepared by methods now known. Carbon being practically infusible, it has not been found feasible to induce crystallization by causing the carbon to solidify from a molten condition. Free carbon is soluble in but few substances, and from such solutions as can be prepared it is deposited mainly in the form of graphite. It dissolves to a considerable extent in melted platinum, but when the metal is allowed to cool and solidify, the carbon is all thrown down as graphite, and no diamonds are obtained. Of the more successful experiments of this sort, those of Moissan are best known. Moissan made use of the known fact that carbon will dissolve to some extent in melted iron. Under ordinary conditions the carbon is here also deposited in the graphitic form; but Moissan found that when the solution is allowed to cool under an exceedingly great pressure a small portion of it appears in the form of minute crystals that possess all the properties of the true diamond, even exhibiting the peculiar pittings on the surface that are characteristic of the natural stone. His method consists in saturating the molten iron with carbon and then pouring it into a mold, and chilling the casting



The Sancy.

as quickly as possible by immersing it in water. The outer layers solidify under this treatment, while the interior is still quite fluid, and the powerful contraction of the surface gives rise to an enormous internal pressure. As the fluid core solidifies, the greater portion of the carbon that it contains is deposited in particles that are distributed throughout the mass. The casting, when entirely cool, is dissolved in acids, and the residue is treated in various ways to effect the removal of the graphite and amorphous carbon. A small precipitate remains behind, in which tiny crystals of diamond may be distinguished. No stones that are large enough to be of commercial value have yet been prepared, and while the process is of great theoretical interest, it is far too expensive, in comparison with the yield, to be practicable even for the manufacture of diamond powder for polishing and grinding purposes.

GEORGE F. KUNZ.

Diamondback Terrapin (*Malaclemmys palustris*). This far-famed turtle belongs to the family *Emydidæ* (q.v.) and may be recognized by the unhinged plastron or lower shell, the concentric grooves and ridges which mark each plate of the upper shell or carapace, the smooth unnotched jaws, smooth skin covering the head, and dark olive or black color. Unlike most terrapins, the diamondback inhabits salt and brackish waters, living in the marshes which fringe our seacoast from Cape Cod to Texas. Formerly very abundant throughout this region, the constant extensive fishing to supply the markets has greatly reduced its numbers, so that the problem of its artificial propagation is now being taken up seriously. The principal fisheries are in Chesapeake Bay and on the coasts of New Jersey and North Carolina. Although a considerable number are dug from the mud while hibernating, a much larger proportion are captured by means of traps, seines, etc., during the summer months, and are confined in pens, where they are fed on oysters, fish, and celery to fatten them for the winter market. From the point of view of the epicure, the diamondback is perhaps the most famous and esteemed product of American waters, and during the season of greatest demand commands almost fabulous prices. Those commonly sold have a length of shell of from five to eight inches, and are supposed to be from 6 to 10 years old. The habits differ but little from those of other terrapins. They are omnivorous, lay their eggs in June and July in small nests excavated in some warm sandy bank, and hibernate during the winter after burying themselves a few inches beneath the mud. See TERRAPIN.

Diamond-beetle, the *Entimus imperialis*, a splendid coleopterous insect belonging to the family *Curculionidæ* or weevils. The ground color is black, but the insect is covered by a large number of scales which appear brilliantly green by reflected light. It is very abundant in some parts of South America.

Diamond-bird, an Australian bird (*Pardalotus affinis*), of beautiful plumage, receiving its English name from the peculiar markings of its feathers. Its general color is gray and white, but spotted with red, yellow, orange, and black. It makes its nest in old tree-trunks, and sometimes burrows in the ground, or utilizes any chance excavation. It feeds on insects.

Diamond Gauge, a gauge for estimating the size of diamonds. In the staff are set crystals of graduated size, by which jewels are compared. The crystals are from one quarter to one sixty-fourth of a carat.

Diamond Industry, a most important and far-reaching department of national and international commerce, which is spreading and increasing, year by year, especially in the United States. The diamond has been a precious stone procured with difficulty, treasured up with jealous care, and sought after by the rich and magnificent for ages. Diamonds are also indispensable for instruments employed in some of the manufacturing and industrial arts. A consideration of the diamond industry must include an account of the mining, polishing, importation, and sale of this gem. The distribution of diamonds in the geological formations of the world, their mining, etc., has been dwelt upon under the article DIAMOND (q.v.). It remains to point out some recent industrial facts of importance, with regard to the separation of diamonds from the concentrates, which remain when the diamantiferous earth has been washed, after being brought to the surface at Kimberley; their importation to this country, and their artificial manufacture. In mining diamonds, it was necessary until recently to go very carefully over the concentrates to pick out the garnets and many other foreign substances until nothing remained but the rough diamonds. This is a slow and laborious operation, but it has been an essential part of the mining industry until it was superseded by a discovery made a while ago. The discoverer was Mr. Fred Kersten, one of the employees in the sorting room. His discovery was accidental. A rough diamond and a garnet happened to be lying on a small board on the bench where he was working. He happened to pick up one end of the board when the garnet glided off, but the diamond remained. Kertsen found that there was a coating of grease on the board which had retained the diamond, while the garnet slipped off. He procured a wider board, coated one side of it with grease and dumped a few handfuls of concentrates on it. Then he found that by holding the board in a slightly inclined position and vibrating it, all the concentrates except the diamonds moved to the lower end and fell off while the diamonds remained in place. Then he invented a machine by which his discovery might be utilized. The invention was an entire success. All the garnets and other minerals that are not wanted pass over the surface of the table, while every diamond, large or small, is retained. The entire work is now done by machinery, and both the young inventor and the owners of the diamond mines are profiting by the new labor-saving device. The United States is a very large purchaser of diamonds. One third of the entire amount of cut stones is owned in this country. The importations are increasing.

More than $30,000,000 worth of diamonds and other precious stones were brought into the United States last year according to the statistics of the Department of Commerce and Labor. This is the largest importation of diamonds and other precious stones ever shown in a single year of United States commerce. Prior to 1887

the total had seldom, if ever, reached $10,000,000 per annum; from 1887 to 1893 the total gradually moved upward until it reached $10,000,000; then it rapidly fell to $5,500,000 in 1894, $7,500,000 in 1895, $6,750,000 in 1896, and $2,500,000 in the fiscal year 1897. In 1898 the total increased to nearly $9,000,000, in 1899 to over $14,000,000, in 1901 to $20,000,000, in 1902 to $23,000,000, and in 1903 will be fully $30,000,000, making the total for the year just ended not only more than in any preceding year, but 50 per cent in excess of 1901, double the figures of 1899, and more than six times the average during the period 1894–7.

This rapid growth in the importation of diamonds, while it suggests general prosperity, also seems to indicate the development of a comparatively new industry in the United States — the cutting of diamonds. The total importations of diamonds alone in the 11 months ended with May amounted to $24,000,000, and of other precious stones $4,500,000. Of the $24,000,000 worth of diamonds imported, $10,000,000 were uncut diamonds; this total of $10,000,000 of uncut diamonds is a large increase compared with the importations of uncut diamonds in preceding years, the figures for 11 months of the year 1902 being $5,500,000, while for the corresponding period of 1901 they were $6,500,000, for the corresponding months of 1900 $3,500,000, and for the corresponding months of 1898 but little over $2,000,000.

The diamonds imported are divided by the bureau of statistics statements into two groups, namely: "Diamonds uncut, including miners', glaziers', and engravers', not set," and "Diamonds cut, but not set." The value of diamonds uncut, including miners', glaziers', etc., imported in 11 months ended with May has grown from $2,500,000 in 1898 to $10,000,000 in 1903, while that of diamonds cut but not set has grown from $4,000,000 in 1898 to $14,000,000 in 1903, these figures being in each case for the period of 11 months. This inference that the cutting of diamonds is becoming an important industry in the United States is strengthened by the fact that the census statistics of "lapidary work" show that the total value of production of lapidary work in 1900 was over $5,500,000, against less than $500,000 in 1890, and that the value of the materials used in this work in 1900 was over $4,500,000, against less than $250,000 in 1890.

It is indeed worthy of note that although the largest percentage of diamonds is cut outside of the United States, and all of them mined in other countries, the most improved machinery and many of the patented devices for mining and cutting have been the products of American ingenuity. Even Gardner F. Williams is an American born and bred.

Although the annual production of diamonds has increased more than 1,500 per cent in the last 30 years, and though there are produced at the present time more than 3,000,000 carats annually, as against 200,000 before the discovery in South Africa, the changed condition has come about in such a manner that the stone has not been cheapened in value, has been fixed on a more even market basis, and has that much enriched the world.

The cutting branch of the industry has almost doubled in the past eight years, and now keeps employed between 700 and 800 men. Nearly five sevenths of the diamond cutting of the world is done in Amsterdam and Antwerp, though New York has recently begun to make its influence felt in that direction. There are about 9 or 10 cutting establishments in New York and Brooklyn, employing from 40 to 80 men each, and although the wages paid to American workmen are much higher than those paid in Europe, the advantage of better machinery in this country averages the cost of cutting. This is especially true in regard to large stones, though not always so with respect to stones running below an eighth of a carat.

Details of the artificial manufacture of diamonds in an electric furnace by Prof. Henri Moissan, at the University of Paris, were published in June 1903. His experiments were begun after his finding of microscopic diamonds in nature, in the "blue earth" from the Cape, in the sands of Brazil, and in several meteorites. His researches showed that if carbon was produced at low temperatures it was always obtained in the amorphous condition and no crystals were found. The details of the manufacture are thus described:

"For his experiment, Prof. Moissan utilized the pressure which is produced in iron when it passes from the liquid to the solid state. It is known in fact that solid iron is less dense than when in fusion, as is shown by the fact that pieces of the metal will float on the melted bath, and it thus resembles water in this respect. He melts the iron in the electric furnace and saturates it with carbon, and to carry this out 200 grammes of Swedish iron cut into cylinders half an inch long and two fifths inch diameter were placed in a carbon crucible and completely covered with powdered charcoal. The crucible was placed under the arc and heated during 3 to 6 minutes with a current of 350 amperes at 600 volts. The cover of the furnace was removed and the crucible seized with a pair of tongs and plunged quickly into a bath of cold water. The crucible and metal remain red for a few moments, giving off gases which come to the top, then the whole cools off. It was not without apprehension that the experiment was made for the first time, as it was feared that an explosion would be produced when the melted mass at 3,000 degrees came in contact with the cold water. But no bad effect is produced by the meeting of the hot mass and the liquid; and during the first period the mass is cooled rather by a rapid radiation. In order to cool it by conduction, and thus more quickly, it was placed in iron filings. In this way the diamonds which were obtained were of a peculiar nature, and they contained specks of black carbon. The pressure seems to be less, and the transformation of the carbon into the diamond is less complete. The experiment is, however, highly instructive, as it gives a form of speckled diamond which is also found in nature. To obtain a more rapid cooling, a bath of melted lead was found the best; it was kept at about the fusing point, or 617° F. The crucible, heated as before, is quickly plunged into the bath of melted lead, which is about 6 inches deep. The iron, which is lighter than the melted lead, is detached from the crucible in masses which tend to form spheres and rise more or less rapidly to the top. When the iron is saturated with carbon in the furnace, it becomes so pasty that the crucible can be turned over and it will not run out, but when it cools off the metal soon becomes liquid and gives up graphite.

"The smallest spheres, half an inch in diameter, were solid and sufficiently cool on coming to the top. These spheres gave a good yield of diamonds and the latter were especially clear and brilliant, and the spotted form was absent. Some of the crystalline forms were very sharp. One of the transparent diamonds measured as high as 0.57 millimetre, and had a somewhat triangular form with the angles rounded off. It was perfectly clear. It is curious to note that three months after its formation it split into two pieces; this fact is significant, as some diamonds from the Cape show an identical action, this being no doubt due to irregularities of pressure at the time of formation. The samples of diamonds obtained by this method were interesting to examine as to their different form. Most of them were smooth and brilliant, while others had a grained surface. All the specimens had the particular lustre which is characteristic of the native diamond. When a ray of light is sent into the interior they appear to become luminous. Some of the specimens are cubes and octahedra, with rounded angles."

Diamond Jousts, jousts instituted by King Arthur, "who (according to the Arthuric legend as set forth by Tennyson) by that name had named them since a diamond was the prize." Before he was king he came by accident to a glen in Lyonnesse, where two brothers had met in combat. Each was slain; but one had worn a crown of diamonds which Arthur picked up, and when he became king offered the nine diamonds as the prizes at nine several jousts, "one every year, a joust for one." Lancelot had won eight and intended to present them all to the queen, "when all were won." When the knight at last laid them all at her feet, Guinevere, in a jealous rage, flung them out of the palace window into the river.

Diamond Necklace, a jewel the incidents connected with which have furnished materials for one of the best historical romances of Dumas. This necklace contained 500 diamonds, was valued at some $400,000, and was made by order of Louis XV. for his mistress, Madame Du Barry. The necklace was not finished in the king's lifetime, and after his death the Du Barry was banished. Between the years 1783 and 1784 the charms of Queen Marie Antoinette had infatuated the Prince-Cardinal Rohan, who was led to believe, by the so-called Countess Jeanne de Lamotte-Valois, an unprincipled adventuress, that the queen reciprocated his feelings. The cardinal was informed that the queen was anxious to purchase the diamond necklace and wished for him to become surety for the price to the makers, MM. Boehmer and Bassauger. The cardinal agreed to become security, the necklace was delivered, but never reached the queen. Jeanne de Lamotte and her husband, meanwhile, had disappeared from Paris, and were selling the diamonds in parcels. The plot was discovered when the jewelers went to court complaining that the necklace had not been paid for. The cardinal and others concerned were thrown into prison. As the trial established rather the folly than guilt of any one excepting the Countess Lamotte, she and her husband were branded on the shoulders as thieves, and sentenced to a life imprisonment. The resultant scandal greatly aggravated that popular rage which terminated in the French Revolution.

Diamond-snake, an Australian serpent (*Python spilotes*). This is a richly colored snake belonging to the true pythons. It inhabits every portion of Australia, particularly Victoria, where the rocks and watered woods afford protection. It is a nuisance to farmers, as it robs the poultry-yards. It is not venomous, but can inflict a painful bite. The markings on the scales give it its name.

Diamond State. See DELAWARE.

Diamond Wedding, the celebration of the 75th anniversary of a wedding, at which presents of diamonds are given. Other anniversary weddings sometimes celebrated are paper, wooden, tin, crystal, and china weddings, namely, on the 1st, 5th, 10th, 15th, and 20th anniversaries; while silver and golden weddings are celebrated on the 25th and 50th, respectively, presents being made to the bride of the material indicated in the title.

Diana, Italian goddess, whom the Romans subsequently identified with the Greek Artemis. Diana was the protectress of slaves, who held a yearly festival in her honor. She seems to have been originally the patron divinity of the Sabines and Latins. She was a virgin, and no man was allowed to enter her temple.

The Greek Diana or Artemis was the daughter of Zeus (Jupiter) and Leto or Latona, and was the twin sister of Apollo, born in the island of Delos. While yet a child she entreated her father to suffer her to continue a virgin. She desired him, at the same time, to give her a bow and arrows, a city, and rule over the hills, 60 Oceanides, and 20 river nymphs, and to permit her to bear a torch and hunt in the forests. Zeus caused 30 cities to be devoted exclusively to her worship, and appointed many others where she was venerated in common with other deities. As Apollo directs the chariot of the sun, Artemis guides that of the moon. Eros and Aphrodite sought to conquer her in vain. Hunting, music, and dancing alone had charms for her. She punished without mercy those of her virgins who violated their vows of chastity. Actæon, grandson of Cadmus, who secretly watched her as she was bathing, she changed into a stag, and his own dogs tore him in pieces. The beautiful Endymion, however, at length made her feel the power of love. While enlightening the earth as Selene (the moon), she beheld the hunter, fatigued with the chase, slumbering in the woods. She descended from her ethereal course, and kissed the lips of the youth, who enjoyed a favor never before granted to mortal or immortal. Notwithstanding her aversion to love, she afforded aid to women who called upon her in travail. She was also the goddess of death. She aimed her darts especially at the female sex, and brought the old, who were satiated with life, to a gentle death, to make way for the vigorous and blooming. When angry she destroyed with pestilence and disease, like her brother Apollo. When offended she revenged without compassion. Thus she slew Orion, the hunter, from jealousy, because Eos (Aurora) had fallen in love with him; so also the daughters of Niobe, because their mother preferred herself above Latona, etc. In the Trojan war both Artemis and Apollo aided the Trojans; and in the war with the giants and Titans she proved her valor.

The worship of Artemis was spread through

all Greece, and the various legends here related do not all refer to the same deity, it being common in ancient mythology to group together under the name of some celebrated divinity the local associations and traditions originally belonging to different mythical personages. She received many surnames, particularly from the places where her worship was established, and from the functions over which she presided. She was called Lucina, Ilithyia, or Juno Pronuba, when invoked by women in child-bed, and Trivia when worshipped in the cross-ways, where her statues were generally erected. She was supposed to be the same as the moon and Proserpine or Hecate, and from that circumstance she was called Triformis; and some of her statues represented her with three heads, that of a horse, a dog, and a boar. She was also called Agrotera, Orthia, Taurica, Delia, Cynthia, Aricia, etc. She was supposed to be the same as the Isis of the Egyptians, whose worship was introduced into Greece with that of Osiris, under the name of Apollo. The Artemisia was a festival celebrated in honor of her at Delphi. At first she was represented with a diadem, afterward with the crescent upon her head, with bow and arrows, a quiver over her shoulders, and a light hunting dress, together with her hounds. Her most famous temple was at Ephesus, and was considered one of the wonders of the world. She was worshipped there as the symbol of fruitful nature, and represented with many breasts, encircled with numerous bands.

Diana of France, Duchess of Montmorency and Angoulême, French intrigante: b. Piedmont 1538; d. 3 Jan. 1619. She was a natural daughter of Henry II.; was formally legitimized, and married first to a son of the Duke of Parma, next to the eldest son of the Constable de Montmorency. She enjoyed great influence at court under Henry IV., superintended the education of the young prince, afterward Louis XIII., and then retired from court.

Diana of Poitiers, pwä-tē-ā, Comtesse de Brézé, Duchess de Valentinois, French beauty: b. 1499; d. 1566. She was the mistress of King Henry II. of France, in whose name she ruled with unlimited power. Till his death in 1559 she exercised such an absolute empire over the king by the charms of her wit and grace, that her superstitious contemporaries ascribed her power to magic. Upon his death she retired to her castle Anet, where she established a charitable institution for the support of 12 widows. Medals are still to be seen bearing her image, trampling under foot the god of love, with the inscription, *Omnium victorem vici* (I have conquered the universal conqueror).

Diana Monkey, a monkey (*Cercopithecus diana*), native to the west coast of Africa. Its name is given because it bears on its forehead a crescent of upright white hairs, suggestive of the new moon, which was the emblem of the Greek goddess Diana. It is black in color, streaked with brown down the back; the fore parts are pure white, as also is the long beard. It is gentle and easily tamed, but is not strong enough to endure captivity and change of climate. Hence the specimens sent to menageries usually die within a short time.

Diana's Tree (*Arbor Dianæ*), silver tree, is formed from a solution of silver in nitric acid, precipitated by quicksilver, and crystallized in prismatic needles which are grouped together in the form of a tree. To make this beautiful process visible, let a quantity of pure silver be dissolved in nitric acid; then dilute the saturated solution with 20 or 30 parts of water, and put in an amalgam of eight parts mercury and one part silver leaf, upon which after some days crystals are formed. The crystals consist of an amalgam of silver, or rather a definite compound of the silver and mercury. The name is formed from the supposed connection between the moon and the metal silver.

Dian'thus, a genus of the pink family (*Caryophyllaceæ*). The genus has about 200 species, natives of the Old World. The name is said to be from the Greek, and to signify "Jove's flower." The American species are all naturalized from Europe, and are fugitives from cultivation. The best known are maiden pink (*D. deltoides*), which in summer is found in the region from eastern Massachusetts to Michigan, and the bunch-pink or sweet-william (*D. barbatus*), found wild occasionally in the Eastern and Middle States.

Diapason, dī-a-pā'zŏn or -sŏn (meaning in Greek, complete, all-pervading), a term in music by which the ancient Greeks designated the octave. The French use the term as equivalent to pitch. Diapason is also the English name given to certain fundamental stops of the organ.

Diapedesis, dī-a-pe-dē'sis, a process in which red and white blood cells pass through the walls of the capillary blood vessels. It is a constant accompaniment of inflammation, and is to be regarded as a protective mechanism on the part of the body, particularly of the white blood cells.

Diaper, a kind of textile fabric much used for towels and napkins, and formed either of linen or cotton, or a mixture of the two, upon the surface of which a figured pattern is produced by a peculiar mode of twilling. In the fine arts the term is used for a kind of surface decoration consisting of the repetition of a simple unit or units of design evenly spaced.

Diaper Ornament, in architecture, an ornamentation of flowers, applied to a plain surface, either carved or painted. If carved, the flowers are entirely sunk into the work below the general surface. They are usually square, and placed close to each other, and are various in their pattern and design. Diaper work was first introduced in the early English style in some of the principal Gothic structures in England.

Diaphoret'ics, or **Sudorifics,** agencies that increase the secretion of sweat. The chief diaphoretics are heat — in the form of hot packs, warm drinks, etc. — alcohol, pilocarpine, opium, salicylates, and a number of the newer synthetic products, such as antipyrine, phenacetine, antifebrine, etc. Diaphoretics are employed largely to reduce temperature, as they increase the perspiration and thus permit of a large amount of surface evaporation. They are also useful agents often in the treatment of disease of the skin, since they cause an increased amount of blood to flow to the skin and thus improve its nutrition.

Diaphragm, dī'a-frăm. 1. In anatomy, a large robust, muscular membrane or skin placed transversely in the trunk, and dividing

the chest from the belly. In its natural situation the diaphragm is convex on the upper side toward the breast, and concave on its lower side toward the belly; therefore, when its fibres swell and contract, it must become plain on each side; and consequently the cavity of the breast is enlarged to give liberty to the lungs to receive air in inspiration; and the stomach and intestines are pressed for the distribution of their contents; hence the use of this muscle is very considerable. It is the principal agent in respiration, particularly in inspiration; for when it is in action the cavity of the chest is enlarged, particularly at the sides, where the lungs are chiefly situated; and as the lungs must always be contiguous to the inside of the chest and upper side of the diaphragm, the air rushes into them in order to fill up the increased space. In expiration it is relaxed and pushed up by the pressure of the abdominal muscles upon the viscera of the abdomen; and at the same time that they press it upward they pull down the ribs, by which the cavity of the chest is diminished and the air suddenly pushed out of the lungs.

There are three openings in the diaphragm, one for the passage of the inferior vena cava; one for the passage of the œsophagus and pneumogastric nerves; and the aortic, through which pass the aorta, the right vena azygos, and thoracic duct. The diaphragm also comes into play in hiccough and sobbing, laughing and crying, sometimes causing hernia, or rupture of the viscera.

2. In optics, an annular disk in a camera or telescope or other optical instrument, to exclude some of the marginal rays of a beam of light. The original form of this beautiful contrivance is the iris of the eye, which shuts out strong light and regulates the quantity admitted.

Diarbekir, dē-är″bĕ-kēr′, Asiatic Turkey, city, capital of the vilayet of Diarbekir. It stands on a high bank overlooking the Tigris, and is surrounded by a lofty massive wall, built of blocks of black porous stone, the best houses being also of the same material. The principal edifices are the great mosque, a fine structure with a square tower, and originally a Christian church: and the Armenian cathedral and Chaldæan church, handsome buildings recently erected. The manufactures, once very extensive but now greatly decayed, consist chiefly of iron and copper ware, leather, silk, woolen, and cotton goods; the bazaars are well stocked with every description of goods, and a limited trade is carried on with Syria and Aleppo. Pop. about 40,000.

Diarrhœa, a symptom of a disordered condition of the intestines, accompanied by too frequent movements of the bowels, due to their increased peristaltic (or wave-like) motion. Like dyspepsia, it is only a symptom of some pathological condition. Diarrhœa is usually the result of some indiscretion in diet, such as the eating of unripe or overripe fruit, improper or indigestible foodstuffs; or of poorly cooked, decomposed, or tainted meats and fish, these inducing a kind of diarrhœa due to a toxic or poisonous bacteria known as ptomaines, and is frequently alluded to as ptomaine poisoning. While relatively more prevalent in the city than in country districts, and oftener found among the poor than the well-to-do, it cannot be said that diarrhœa is particularly a disease of the city or of the poor, since severe and even fatal attacks of it frequently occur among the rich inhabiting the seaside or mountains.

The conditions that produce diarrhœa are varied and numerous. Exposure and sudden chilling of an overheated body, particularly of the abdomen, are potent causes; and travelers who make frequent changes of drinking water are very susceptible to it. In these cases personal idiosyncrasy plays an important role. The drinking of impure water and living in poor hygienic surroundings cause diarrhœa. Whether sewer gas or pollution of the atmosphere has direct influence is a disputed point, but it is certain that direct drainage of polluted sewage from districts infected with epidemic diarrhœa into a water supply is a potent cause.

Daily variations of temperature, such as are experienced in the hot season from May to September, are familiar predisposing factors. Environment such as is found in densely populated districts where people live in damp basements, etc., with vitiated atmosphere and want of care, is in the same category of causes.

Diarrhœa is often caused by the irritating action of mineral poisons, such as mercury, arsenic, and antimony, by overdoses of croton oil, etc., or by various cathartic nostrums. Worms of various species are likewise causative factors. Of late much attention has been given to these parasitic causes, notably that of protozoön *Amœba coli,* so frequently found in the stool of diarrhœics, principally in tropical cases. Secondary diarrhœa is a phenomenon found during an attack of some antedating disease, as ulcer of the bowel, cancerous growths of the intestines, and the inflamed and ulcerative stage of typhoid fever. In diabetes and Bright's disease it is mostly a form of eliminative diarrhœa. Nervousness, particularly in women, is an annoying cause due to a temporary local congestion of the mucous membrane of the intestine.

The symptoms of diarrhœa naturally vary with the causes, though certain symptoms are common to all forms. One of these is the frequency and character of the stools, which may vary from 5 to 20 or more in a day. At first soft, and mixed with particles of undigested food, they gradually grow more liquid until almost watery, and are attended by griping colic-like pains about the navel. Flatulence and vomiting are also prominent features, and thirst is often great, owing to loss of liquids from the body through repeated evacuations. The pulse is usually quickened, though the fever is seldom high, and is of no serious consequence. If the diarrhœa become chronic or long continued, prostration ensues, though this contingency is infrequent. Secondary diarrhœa, due to chronic congestion or pathological changes in the intestines, is much more intractable.

The treatment of diarrhœa must necessarily vary with the inciting cause, though many cases recover spontaneously or need treatment for only a few days. Absolute rest and low diet are indicated in all forms. If the attack is due to exposure or cold, the application of hot turpentine stupes to the abdomen, with the administration of small and frequent doses of opium and bismuth, may be all that is required, when, however, it is due to offending food in the intes-

tines, or to ptomaines, the prompt removal of these elements must be effected. Broken doses (one tenth gr.) of calomel every half hour, or a teaspoonful dose of Epsom salts in Vichy water, until the stools assume a more natural consistency, are prompt and efficient remedies. By far the most popular is a prepared dose of castor oil containing 10 or 15 drops of laudanum. This should be followed by astringent antiseptics, combined with opium and a digestive; for instance, sulph-carbolate of zinc or soda, opium in either powdered or extract form, with blue-mass. Should the pain be excessive, chlorodyne, or hyoscyamine, or in extreme cases small doses of morphia may be given until the patient is relieved. For the vomiting, small doses of hot water, or plain lime water will be effective, and the application of the old-time spice-plaster or hot poultice will be found soothing. Some prefer the ice-bag. Should there be any oppression, aromatic spirits of ammonia, or stimulants like brandy or whiskey, well diluted, will restore the strength, though this is seldom necessary.

The undue haste to stop diarrhœa suddenly, and the eagerness which patients exhibit to take large doses of paregoric or laudanum, or nostrums called cholera drops or diarrhœa mixtures, in all cases is mentioned only to be condemned. A more rational course is to remove the cause, thereby assisting nature to regain her normal tone and re-assert her disturbed functions.

In children and infants the same general rules should be followed, with modifications to suit each individual. In place of milk, substitute a milder form of nourishment such as egg, barley, or rice water. (See CHOLERA INFANTUM.) Another and more direct form of treatment than giving remedies by the mouth is the use of enemas, or both can be employed in conjunction. High rectal enemas are used of astringent antiseptics held in suspension in thin starch solutions, or with turpentine added.

The constipation which usually occurs after recovery from diarrhœa had better be disregarded for a day or two, when mild cathartics or laxative remedies can be used. Very effective remedies are glycerine suppositories and enemas of cold water.

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Diary, a daily record of events or observations made by an individual. It contains a narrative, more or less detailed, of matters of personal interest, often including the results of reading or meditation. Yet references to current events of general interest are sometimes introduced. This form of diary is also known as a journal. To the mercantile man a diary serves the purpose of an order or memorandum book; while the physician finds it indispensable as a register of engagements. Books convenient for making such records are issued every year, containing besides the blank pages, various reference tables, etc. The "Ephemeris" of the ancients was originally a military record or journal, a day-book or account-book, also a collection of tables showing the position of the heavenly bodies, but passed into literature to mean a collection of records of what has happened on the same day in various years, or a mere general name for any form of periodical books or magazines.

Diaries have often furnished the historian with invaluable material, supplying the absence of public records, and furnishing minute and intimate details of manners and of motives that do far more to help us to understand the past than more formal records. Such documents as Robert Baillie's 'Journals,' the 'Diaries' of Pepys and Evelyn, and the 'Journals' of Greville are among the most valuable sources of real history.

Dias, Antonio Gonçalvez, ān-tō'nē-ō gōn-săl'vĕth dē'as, Brazilian poet: b. Caxias to Aug. 1823; d. 3 Nov. 1864. He was educated in Portugal, and returning to his native country, published at Rio de Janeiro in 1846 a volume of poems entitled 'Primeiros cantos,' which was followed by his drama of 'Leonor de Mendonça' (1847); 'Segundos cantos' (1848); and 'Ultimos cantos' (1850). In 1848 he was chosen professor of national history in the college of Dom Pedro II.; he was subsequently employed in the office of the minister of foreign affairs, and in 1855 was charged with a scientific mission to Europe. His poetry has been exceedingly popular in Brazil.

Dias, Bartholomeu, bär-tō-lŏm-mā'oo, Portuguese navigator: b. about 1445; d. 29 May 1500, while on his way from Brazil to India. In 1486 he sailed on an expedition to explore the west coast of Africa, and without knowing it was carried around the southern point of the continent and landed at the mouth of Great Fish River, where he discovered that he was on the east coast. The stormy cape he called Cabo Tormentoso, a name which the king of Portugal changed into Cape of Good Hope. Dias subsequently sailed on another African expedition under Vasco da Gama, and commanded one of the vessels in the fleet with which Cabral discovered Brazil. It was on this expedition that he perished.

Dias, Henrique, ān-rēk', Brazilian general: b. Pernambuco about 1600; d. latter part of the 17th century. He was a freed negro, who by his superior attainments rose in 1639 to the supreme command of the colored soldiery of the Brazilian army. He took a conspicuous part in the protracted warfare which finally led to the overthrow of Dutch influence.

Diaspore (Gr. "scattering"), a native hydrated oxide of aluminum, having the formula $Al_2O_3.H_2O$, and crystallizing in the orthorhombic system. It is commonly gray, creamy-white, or lilac in color, though sometimes various shades of brown and yellow, or colorless. It has a hardness of from 6.5 to 7, and a specific gravity of about 3.4. It is transparent to subtranslucent, and exhibits powerful doubly refracting properties. The best known localities in which it occurs are Chester, Mass., Newlin, Pa., in the United States, and in Europe near Schemnitz, Hungary. Many specimens decrepitate strongly when heated before the blowpipe, separating into pearly scales that are scattered in all directions; and it is from this peculiarity that the mineral derives its name.

Diastase, dī'a-stās, a substance existing in barley, oats, and other plants, and also in animals. When in solution it possesses the property of causing fecula or starch to break up at the temperature of 156° F., transforming it first

into dextrine and then into sugar. It is obtained by digesting in a mixture of three parts of water and one of alcohol, at a temperature of 113° F., a certain quantity of germinated barley ground and dried in the open air, and then putting the whole under pressure and filtering it. It is solid, white, and soluble in water and diluted alcohol, but insoluble in strong alcohol. If 200 parts of fecula be mixed with 1,000 parts of water, and a portion of diastase be added, and the mixture kept at a temperature of about 156° F., the starch is converted gradually into dextrin and grape-sugar. The action of diastase is prevented by acids, alkalies, and some salts, but not by alcohol or ether. A solution of diastase becomes acid, and loses its power on starch. The action of the diastase of germinating barley is important in brewing. The composition of diastase has not been exactly determined. It is, however, an albuminoid substance. A body having the power of converting starch into sugar exists in saliva and is known as ptyalin. It is also an albuminoid, and is probably analogous to diastase in its composition. Diastase is used in the manufacture of dextrin (q.v.), and it has also been proposed for dissolving the starch and dextrin used by printers for thickening their colors.

Diastole, dī-ăs'tō-lē. In the description of circulation of the blood it was shown that Harvey first appreciated that there was a successive contraction and dilatation of the heart-muscle. The term systole has been applied to this contracted state and the term diastole to the succeeding dilatation.

Diather'mancy, a term designating the property that is possessed in various degrees by different substances of transmitting radiant heat. Bodies that are equally transparent, that is, bodies which have equal power of transmitting rays of light, are very different in their power of transmitting heat rays. Thus a thin plate of glass and a thin plate of rock salt may be nearly equally transparent, but the plate of rock salt has far superior power of transmitting rays of heat. This may be shown very simply. Let a delicate thermometer be placed near to a lamp (but not above it), the mercury will rise on account of the heat radiated to it. If a plate of rock-salt be interposed between the lamp and thermometer, the mercury will fall slightly; but if a plate of glass of equal thickness with the plate of rock-salt be interposed, it will be seen that the greater part of the heat is at once cut off from the thermometer. The transparency of bodies to light does not at all necessitate their diathermancy. Thus clear rock-crystal, which is transparent, and smoky rock-crystal, which is opaque, are nearly equally diathermanous; and solution of iodine in bisulphide of carbon, which is perfectly opaque to light, is highly diathermanous. The diathermancy of plates of various thickness has also been determined. The diathermancy decreases very rapidly as the thickness increases. Consult: Stewart, 'Treatise on Heat'; Deschanel, 'Elementary Treatise on Natural Philosophy.' See also RADIATION; THERMO-ELECTRICITY.

Diathesis, dī-ăth'ē sĭs. There is in all organic life a certain predisposition for the constituents of the cells to behave in a certain predetermined manner, and in medicine this term comes to mean the predisposition or constitution of a body by virtue of which certain of its tissues or organs become at one time or another the seat of affections similar in their nature. Thus there exists in certain families a tendency to the development of certain constitutional diseases, such as gout, rheumatism, tuberculosis, etc. In others there may be a predisposition to nervous instability. In others there are conditions which bring about ready disturbance of the digestive powers. In most of these instances there seems to be a point when the store of vitality in the tissues of an organ becomes exhausted earlier than in other predisposed individuals, so that diathesis may be described in other words as a premature localized breakdown.

Diatomaceæ. See DIATOMS.

Diatoms, dī'a-tŏmz, a sub-order of microscopic plants belonging to the class *Algæ*. A plant of this sub-order consists of a unilocular or a septate cell; and its cells are composed of two symmetrical valves, multiplying by spontaneous separation. There are two well-defined sections: (1) *Diatomeæ,* including species invested with a silicious epidermal covering, occurring both in fresh and salt water, often exhibiting exquisite sculpturings when seen under the microscope, and testing the highest powers of the instrument; (2) *Desmidieæ,* minute fresh-water plants of a green color, without a silicious covering. There are more than 4,000 distinct species scattered over all parts of the world. The walls of the cells are rendered hard by silica and they are reproduced by fission, the splitting taking place parallel to the longer axis. When the protoplasm escapes the cell walls retain their shapes and delicate markings. Enormous quantities of them are found as fossils in the beds of the Tertiary formation. Often the protoplasm of two diatoms will escape and unite to form a zygospore, which after a time will divide into two, each forming a new cell larger than before. Some diatoms are free and move rapidly through the water; others secrete a mucilaginous substance whereby they attach themselves to various objects. In some cases the diatoms, after splitting, remain attached to one another, forming bands or ribbons. They are classified, according to the structure of the cell walls, three main families being recognized, according as they have on the principal face of the wall a distinct ridge (*Raphidieæ*), an indistinct or false ridge (*Pseudoraphidieæ*), or no ridge at all (*Araphidieæ* or *Cryptoraphidieæ*).

The diatoms possessing a silicious epidermis have been eagerly studied of late years by microscopical observers, who have greatly increased the number of genera and species. They are universally distributed, and their silicious coverings being indestructible, their remains are accumulated and perpetuated in many localities, sometimes forming extensive deposits, as of Richmond, Va., which is said to be built upon a stratum of these microscopically minute atoms 18 feet in thickness. Species of *Arachnoidiscus* and other genera of great beauty are obtained from guano. The bergmehl or mountain-meal of Sweden consists of diatoms. The mud at the mouths of many rivers, the sediment of ponds, ditches, and even rain-troughs, contain myriads of the same minute organisms. They were found by the Arctic navigators investing the

fields of polar ice; and they have also been detected in the dust evolved from volcanoes.

Diatonic, a term used in the science of music, originally from the Greek, meaning "through the tones." The diatonic mode of the ancient Greeks — as distinguished from their chromatic and enharmonic mode — formed the foundation of their whole system of music, and was arranged in three tetra chords composed of one semitone and two whole notes. In modern music the term is applied to compositions which follow the tones, intervals, or harmonies of the standard major or minor scales, without chromatic alteration.

Diatribe, dī'ą-trīb (Greek, *diatribé*), a dwelling or lingering upon, originally signified a sustained discourse or disputation, afterward came to be applied to a violent and sweeping criticism, whether written or spoken.

Diaz, dī'āz, **Abby Morton**, American writer: b. Plymouth, Mass., 1821; d. Belmont, Mass., 1 April 1904. She was a member of the famous Brook Farm Association, and has been an earnest worker in social reforms. She founded the Woman's Educational and Industrial Union of Boston, and was its president for many years. Her books for children include: 'The Cat's Arabian Nights' (1881); 'The John Spicer Lectures' (1887); 'Polly Cologne'; 'Jimmyjohns'; and 'The William Henry Letters' (1870). Other works are: 'Bybury to Beacon Street, a Discussion of Social Topics'; 'Domestic Problems'; 'Only a Flock of Women' (1893).

Diaz, Miguel, mē-gĕl' dē äth, Spanish explorer: b. Aragon second half of the 15th century; d. 1514. He took part in the second voyage of Columbus, and was one of the colonists of the island of St. Domingo. He quitted the colony in 1495 in consequence of a duel, and took refuge with a few of his companions in the southern part of the island, where he married a native. Through the advice of his wife he discovered the gold mines in this part of the island, the existence of which he communicated to Bartolomé Columbus, whereby he reconciled himself with the colonists, and led the way to the foundation of the town of Nueva Isabella, afterward called St. Domingo. He was made governor of Porto Rico in 1509, but his fidelity to the family of Columbus repeatedly brought him into trouble.

Diaz, Porfirio, pōr-fē'rē-ō dē'äs or dē'äth, Mexican statesman: b. Oaxaca 15 Sept. 1830. He received a classical education at the Oaxaca Institute, and had begun studying law when the war with the United States broke out. He served through that struggle in the National Guard, and on the conclusion of peace made a study of military science. On Santa Anna's accession to the dictatorship, he left the army and practised law; but returned and bore a conspicuous part in the revolution of 1854; took the field to oppose the French troops and was taken prisoner, but made his escape; harassed Maximilian's troops till forced to surrender a second time at Oaxaca in 1865; besieged and captured Puebla in 1867, and immediately marched on Mexico City, which surrendered to him 21 June. On the re-establishment of the republic he was an unsuccessful candidate for president. In 1872 and 1876 he led revolutions against the government, and after three severe battles occupied the capital in the latter year. In 1877 he was elected president to fill the unexpired term of the fugitive president, Lerdo. According to the "plan of Tuxtepec," which he had proclaimed, he was ineligible to succeed himself. His secretary, Gen. Gonzales, was elected president, and Gen. Diaz was appointed chief-justice of the supreme court, and elected governor of Oaxaca. In 1884 he was re-elected president; in 1886 his partisans secured the abolition of the law prohibiting a second consecutive presidential term, and he has been thereafter continuously re-elected, his sixth term expiring 30 Nov. 1904. To Diaz Mexico is indebted for her rise, progress and standing as a nation. He has made property secure by preserving a stable government, and deserves the confidence of his people.

Diaz, Ruy, roo'ē dē'ath, Spanish soldier: b. Seville, Spain, 1503; d. Peru 1538. He went to Peru in 1532 with the expedition of Diego de Almagro, and took part in the conquest of Cuzco; then joined Velalcazar in the conquest of the province of Quito. He was sent by Pizarro to explore the valley of the Rimac, and it was in accordance with his report that the site was chosen for the city of Los Reyes (now Lima), and the city founded. When war broke out between Almagro and Pizarro, Diaz sustained Almagro, was in the battle of Abancay 1537, and other important engagements, and was captured at the battle of Salinas 1538, and put to death.

Diaz del Castillo, Bernardo (vulgarly **Bernal**), one of the Spanish conquerors of Mexico, and historian of that conquest: b. Medina del Campo, in Old Castile, about 1498; d. Santiago de los Caballeros, Guatemala, leaving numerous descendants. His work, entitled 'Historia Verdadera de la Conquista de la Nueva España,' is of uncommon value and interest. Date of his death not known. Probably his family belonged to the minor nobility: he says, when speaking of the conquerors, "We were for the most part hidalgos, although some were not of such clear lineage as others"; but he lacked the influence necessary to secure his appointment as an officer. He speaks of himself as "having been in this country (Central America and Mexico) twice before the coming of Cortés, and the third time with him." On the first occasion he accompanied Pedrarias Davila (q.v.); on the second, he took part in the expeditions to Yucatan and along the coast of Mexico under Córdoba and Grijalva (1517–18). Between 1515 and 1517 he visited Cuba; from Santiago de Cuba, on 18 Nov. 1518, he sailed with the Spanish fleet under Cortés; during the next few years he fought, it is said, in more than 100 of the battles with the Indians preceding or following the capture of the City of Mexico; and in 1523–4 he served under Pedro de Alvarado, conqueror of Guatemala and Salvador. Alvarado established the seat of government in the native (Guatemalan) town of Almolonga, afterward called Santiago de los Caballeros; and Bernal Diaz was made governor of this town, as a reward for his service in the field. He writes naïvely: "I was held in no inconsiderable degree of estimation in my day as a soldier"; and again, "I was twice in the hands of the enemy who were carrying me off to sacrifice, but God gave me strength to

escape out of their clutches." In 1550 he was summoned to an important council at Valladolid, "as being the most ancient of the conquerors of New Spain." His history was finished 26 Feb. 1568. Two licentiates who examined the work at that time, "observed that in regard to my style or language it was conformable to that in ordinary use in Old Castile, and that as such it was the more agreeable, not being embarrassed with flowering, affected phrases." The particular merit of the history is that it gives to each of the officers and soldiers the credit which was his due, instead of ascribing the overthrow of the Aztec empire and the establishment of New Spain solely to the genius of Cortés. "The historians Gomara and Illescas," Diaz writes, "never chose to relate our heroic actions, leaving all our value and honors in the dark, where they would have remained were it not for this my true history, and assigning such great merit to Cortés. Although they were right to a certain degree (in praising our leader), yet they should not have forgotten us." So desirous is he to make known the exact truth, that at the end of his manuscript he writes, "I beg the printers (señores impresores) for mercy's sake not to omit anything from or add anything to the foregoing."

MARRION WILCOX.

Diaz de Escobar, Narciso, när-thē'sō dē ăth dā ĕs'kō-bär, Spanish poet: b. Malaga 25 June 1860. He won great popularity with his lyric poems, and several of his dramatic compositions have been very successful. 'A Morisco Episode'; 'The Young Men of the Day'; 'Two Husbands and a Wife.' In collaboration with other writers he has published a volume of 'Character Sketches from Madrid.'

Diaz de la Peña, Narcisse Virgile, dē'ăth dā lä pē'ñä, French painter b. Bordeaux 20 Aug. 1807; d. Mentone, France, 18 Nov. 1876. He was of Spanish parentage, and at the age of 15 was apprenticed to a porcelain painter, but ambitions of working in oils about 1831 began to exhibit in the Salon. He in time won fame by his landscapes, which he peopled with nymphs, loves, and satyrs. These figures are badly drawn, but as a colorist Diaz ranks highly among the painters of the romantic school in France, and to color he was content frankly to sacrifice form. He was also an exquisite painter of flower-pieces.

Diaz de Pineda, Gonzalo, gōn-thä'lō dē-ăth dā pē-ñā'dä, Spanish soldier: b. Torrelavega about 1500; d. Peru 1545. He went to Peru with Francisco Pizarro in 1531; explored the river Magdalena in 1535; and in 1539 became governor of the province of Quito. In 1540 he joined the expedition of Gonzalo Pizarro for the conquest of the Canelos and the exploration of the country east of the Andes. He was sent in search of the party of Orellana, who had gone ahead to seek for supplies. In the course of the search, which was unsuccessful, Diaz explored a large part of the course of the Amazon, but returned to the main expedition, which by his aid succeeded in returning to Peru, though with heavy losses. When Gonzalo Pizarro revolted against the viceroy, Nuñez, Diaz at first offered his services to the viceroy, but later joined Pizarro. He was surprised and defeated by Nuñez, but escaped capture.

Diaz de Solis, Juan. See SOLIS, JUAN DIAZ DE.

Dib'din, Charles, English lyric and dramatic poet and actor: b. Southampton March 1745; d. London 25 July 1814. He opened a little playhouse in London, the Sans Souci Theatre, and there brought out his own plays, enlivened with his own songs, set to music of his own composition, and with himself as the leading actor. He wrote probably 50 plays and operettas (best remembered among them 'The Quaker,' an operetta), two novels, a 'History of the Stage,' and over a thousand songs. His 'Sea Songs,' such as 'Tom Bowling,' and 'The Flowing Can,' are popular favorites still. He wrote an autobiography: 'Professional Life' (1803).

Dibdin, John Thomas, English song writer and dramatist: b. London 21 March 1771; d. there 16 Sept. 1841. He was the second son of Charles Dibdin (q.v.), and in 1775, when only in his fourth year, was brought upon the stage as the Cupid of Shakespeare's 'Jubilee,' while Mrs. Siddons personated Venus. After being connected with various theatres, and writing great numbers of songs, he returned to London in 1795, wrote a number of dramas with great success for the minor theatres, and obtained an engagement at Covent Garden, with which he continued connected for 14 years. Among his numerous pieces the best known are: 'Mother Goose,' by which the theatres are said to have netted a profit of $100,000; the 'High-mettled Racer,' which was almost equally profitable; 'The Cabinet'; 'The Jew and the Doctor'; and 'Past 10 O'clock,' which long held the stage. He wrote a 'Metrical History of England' (1813); and 'Reminiscences' (1827).

Dibdin, Thomas Frognal, English bibliographer, son of the elder brother of Charles Dibdin (q.v.), the celebrated naval song writer: b. Calcutta 1776; d. Kensington 18 Nov. 1847. He became a popular preacher in London, and was well known there as a bibliomaniac. He proposed a club to dine together in honor of bibliography, which was established in 1812, under the name of the Roxburghe Club. This club adopted a rule that each member should every year reprint a book for presentation to all the members. Of his numerous writings those connected with bibliography are alone of any value. Among them may be noted: 'Bibliomania' (1809); 'Bibliographical Decameron' (1817); 'Typographical Antiquities of Great Britain' (1810–19).

Dibranchiata, dī-brăn-kī-ā'tà, an order of cephalopods (see CEPHALOPODA), characterized by the possession of two gills only, and by the fact that the shell, if external, as is rarely the case, is never chambered. It includes the cuttlefishes, squids, and paper nautilus, as well as the extinct family of *Belemnitidæ*. The order contains two sections, *Octopoda* and *Decapoda*.

Dibutades, dī-bū'ta-dēz, Greek sculptor or potter of Sicyon: lived about 600 B.C. Although he is the reputed originator of work in relief, the only historical basis for his fame is a Corinthian work, bearing his name, supposed to date from before 600 B.C.

Dice (plural of **Die**), small cubes of bone, or ivory, on each of the six sides of which a number, ranging from one to six, is marked permanently. The sum of the two numbers on the opposite sides of a die is always seven; thus if six is at the top one is at the bottom, and so on. One, two, three, or five dice are used, according to the game to be played. It, or they, are placed in a cylindrical box about four inches high, and from one and a half to two inches in diameter, open at the top. The box is shaken and turned quickly up so that the dice will fall flat on the table. The aggregate amount of the spots uppermost at each throw are summed up and placed to the score of the thrower. The purposes to which the throwing of dice is put are endless, besides the many games in which they are used in a variety of ways. The principal games are "throwing the dice," "round the spot," "centennial," "multiplication," "going to Boston," "draw poker," and "vingt-un," all of which will be found described in detail with the rules of each game in A. Howard Cady's 'Dice' (1895).

There is no period of history, and no nation, in which some form of dice has not been used. They are depicted on the early Egyptian monuments; those excavated at Thebes can scarcely be distinguished from the dice made to-day, and their use is attested by laws regulating the games played with them in ancient Greece and Rome, as well as in most European countries.

The invention of dice is attributed to Palamedes (circa 1,244 B.C.). But the use of cubes with numbered sides for gambling purposes is probably much earlier.

The Latin word for dice, *tesseræ*, is derived from the Greek *tesseres*, Ionic for *tessares*, four, because it is on every side square. Numerous passages in the ancient writers, and very many representations in marble or paintings, show how frequent dice-playing was among them. Different from the *tesseræ*, which were precisely like our dice, were the *tali* (which means, originally, the pastern bone of an animal — Greek, *astragalos*). These were almost of a cubic form, and had numbers only on four sides, lengthwise. Three *tesseræ* and four *tali* were often used together, and the game with dice was properly called *alea*, though *alea* afterward came to signify any game at hazard, and *aleator* a gambler.

Dicentra, dī-sĕn'trạ, a genus of plants of the poppy family (*Papaveraceæ*), now generally known as *Bicuculla*, original spelling *Bikukulla*, Greek for double-hooded. The genus numbers about 15 species, natives of North America and western Asia. The best-known American species are the Dutchman's Breeches (*B. cucullaria*), and bleeding-heart (*B. crimia*). The common squirrel-corn (*B. canadensis*), is also a member of the genus. The Dutchman's Breeches grows in woods from Nova Scotia to Lake Huron, Mich., and Washington, south to North Carolina and Missouri. Bleeding-heart is found in rocky places from the western part of New York, south to Georgia and Tennessee, along the mountain ranges.

Dicerathe'rium, an extinct genus of rhinoceroses which inhabited North America during the Oligocene Epoch, distinguished by a pair of horns one above each eye, instead of on the middle line of the head.

Dicey, Edward, English journalist and author: b. Leicestershire, England, 1832. He was graduated at Trinity College, Cambridge, and was from 1870 to 1889 editor of the 'Observer.' He has published: 'Rome in 1860' (1861); 'Cavour: a Memoir' (1861); 'Six Months in the Federal States' (1863); 'The Schleswig-Holstein War' (1864); 'The Battlefields of 1866' (1866); 'A Month in Russia During the Marriage of the Czarewich' (1867); 'The Morning Land' (1870); 'Victor Emmanuel' (1882); 'England and Egypt' (1884); 'Bulgaria, the Peasant State' (1895); 'The Story of the Khedivate' (1902).

Dichot'omous (Gr. "divided into two equal parts"), a term specifically used in botanical description to designate any appearance of branching by forking. Thus the stems of some phanerogams — for example, mistletoe, doum-palm, and many inflorescences — for example, *Caryophylleæ*, begonias — appear forked, while an ordinary fern-frond has no such appearance. The progress of morphological research has, however, shown that true dichotomy — for example, complete division of the growing point into two lateral apices, is really as characteristic of development of the fern-frond as of such obviously dichotomous vegetation as that of *Selaginella;* while conversely the appearance of forking in phanerogams comes about simply by the suppression of the growing point, and the development of two new axes from opposite lateral buds. Outside the cryptogams, indeed, no case of true dichotomy has been described, with the doubtful exception of the roots of cycads. See CRYPTOGAMIA; CYCADS; FERNS.

Dichot'omy in logic, a distribution or separation of ideas by pairs; the division of a class into two sub-classes opposed to each other by contradiction, binary classification as revived by Ramus against the Aristotelians; the Platonic doctrine that all classification should be by dichotomy. Since Kant this opinion has found scant favor.

In botany, a term applied to that kind of branching by a constant furcation or division into two parts, as where the stem of a plant branches into two branchlets, each of which in its turn divides into others, and so on. Example, the mistletoe. The veins of various ferns thus branch dichotomously.

In astronomy, that phase of the moon where it appears bisected or is only half illuminated, as at the quadratures.

Dichro'ic Crystals, so called from their property of exhibiting two colors when polarized light is passed through them in different directions. Thus dichroite, a mineral described below, appears deep-blue in the direction of the principal axis, and yellowish-brown in a direction at right angles to it, even when viewed with ordinary light. Brewster gives a list in his 'Optics' of over 30 crystals which exhibit this property with the aid of a polariscope. The name trichroic is applied to crystals which exhibit three colors when viewed in three directions.

Dichroic Crystals, those which exhibit dichroism (q.v.).

Dichroism (Greek, *dis*, "twice," *chroa*, "color"), the property which many colored doubly refracting crystals have of exhibiting

different colors in different directions. Thus the color of a green tourmaline appears very much darker in the direction of the vertical axis than when the crystal is viewed at right angles to that axis. As in many instances three colors are exhibited, the term "pleochroism" (Greek *pleon*, "more"; *chroa*, "color"), being of a more general character, is often used. A crystal of iolite (dichroite) appears blue in the direction of the vertical axis, yellowish-white in the direction of the macro-axis and bluish white in the direction of the brachy-axis. Dichroism is best detected by the instrument known as the dichroscope. This consists of a rhomb of Iceland spar with wedges of glass cemented at each end of it. These are enclosed in a metal cylinder with a lens at one end and a square opening at the other. If a section of a dichroic crystal is placed in front of the orifice and is viewed through the instrument, two colored squares are seen side by side, one corresponding to the ordinary ray, the other to the extraordinary ray. Dichroism may also be observed by means of the polarizing microscope, by removing one of the nicols and revolving the stage. This furnishes a method of determining in rock sections biotite, tourmaline, epidote and hornblende, all of which are dichroic. Thus hornblende is easily distinguished from augite, which is not dichroic. Optically uniaxial crystals, or those belonging to the tetragonal and hexagonal systems, are dichroic; optically biaxial crystals, or those belonging to the orthorhombic, monoclinic and triclinic systems, are trichroic. Isotropic bodies, including isometric crystals and also amorphous substances such as opal and glass, transmit the same color in any direction. Dichroism, or the allied term "Dichromatism," has also been applied to those fluids which appear of different colors when viewed by reflected and refracted light; when seen in thick or thin layers, etc. For example, venous blood, or any blood impregnated with carbonic acid, hydrogen, or nitrogen, appears, when seen in moderately thin layers, to be of a purple color; while in extremely thin layers it appears green. This property of marked color-variation is due to the difference in the absorption of the light-vibrations in different directions. The property of dichroism is a great aid to the jeweler in distinguishing gems. Diamonds, spinels and garnets show no dichroism; sapphire, ruby, emerald, beryl, tourmaline, topaz and chrysoberyl all have characteristic dichroism.

Dick, James, Scottish merchant: b. Forres, Morayshire, November 1743; d. 24 May 1828. He left over $565,000 to promote higher learning among the parish schoolmasters of the shires of Elgin, Banff, and Aberdeen. The annual value of the bequest exceeds $20,000, allowing a payment of about $150 to each teacher participating.

Dickcissel, dĭk-sĭs'sĕl, or **Black-throated Bunting** (*Spiza americana*), a species of finch in which the male is easily distinguished by a conspicuous jet-black throat-patch on a light yellowish background; the upper parts in both sexes are grayish brown variously streaked above with both lighter and darker shades. During the nesting season the black-throated bunting inhabits cultivated fields of the eastern United States, especially southerly. It winters in South America. The song is a very simple unmusical ditty, and the nest is built on or very near to the ground.

Dickens, Charles, English novelist: b. Landport, Portsmouth, 7 Feb. 1812; d. Gadshill, near Rochester, England, 9 June 1870. His earliest years were passed chiefly at Chatham and in London, where his father, a very careless and improvident man, spent some time along with his household in a debtors' prison. Charles about this period, and while still a mere boy, was a drudge in a blacking warehouse. He got but little education, but about 1826 became an attorney's clerk, and while in this position studied shorthand and other subjects, and finally was able to exchange his occupation for that of a newspaper reporter and critic. In 1835 he was engaged on the *Morning Chronicle*, then one of the leading daily papers of the metropolis. On 9 June 1835 appeared the first of the series of 'Sketches of Life and Character by Boz,' which were published in the evening edition of that paper, under the title of 'Thoughts About People, by Boz.'

The 'Sketches by Boz, Illustrative of Every-day Life and Every-day People' were published in 1836, with illustrations by George Cruikshank. From this publication may be dated the origin of Dickens' fame. Chapman and Hall engaged him to prepare the letterpress for a series of comic sketches on sporting subjects, the outcome of which was the immortal 'Pickwick Papers' (1837). Great characteristics of Dickens' genius were now fully apparent, and his fame rose at once to the highest point.

The next important literary engagement of Dickens was with Bentley's 'Magazine,' which he edited for two and a half years under the pseudonym of Boz. In these volumes appeared 'Oliver Twist' (1839). Before the completion of 'Oliver Twist,' 'Nicholas Nickleby' was begun, and like Pickwick was published in monthly shilling parts. It was issued complete in 1839. Accompanying it, besides the usual illustrations, is a portrait by Maclise, in which the author is represented as "a somewhat dandified young man in a high velvet-collared coat."

'Master Humphrey's Clock,' issued in weekly numbers, contained among other matter two other leading tales, 'The Old Curiosity Shop,' and 'Barnaby Rudge,' the latter a historical tale, going back to the time of the Gordon riots. Both were published separately in 1841. The same year he visited America for the first time. Here many aspects of society struck him in a curious light, and on his return he wrote 'American Notęs for General Circulation' (1842). His next novel, 'Martin Chuzzlewit' (1844), dwelt again on his American experiences.

The series of 'Christmas Tales' excited a new sensation of wonder and delight. These tales were: 'A Christmas Carol' (1843); 'The Chimes' (1844); 'The Cricket on the Hearth' (1845); 'The Battle of Life' (1846); 'The Haunted Man and the Ghost's Bargain' (1847). In 1845 Dickens went to Italy, and paid a visit to Rome, and on 1 Jan. 1846 in the first number of the *Daily News* appeared the first chapter of his 'Pictures from Italy.' Immediately after this followed 'Dealings with the Firm of Dombey and Son, Wholesale, Retail, and for Exportation' (1848); and 'David Copperfield' (1849–50). In 1850 Dickens commenced to edit the weekly serial, 'Household Words,' in

which various original contributions from his own pen appeared. Later works were: 'Bleak House'; 'A Child's History of England' (1852–4); 'Hard Times' (1854); and 'Little Dorrit,' commenced in 1857. In 1859 'All the Year Round' superseded 'Household Words'; and in the first number of this periodical, 28 May, was begun 'A Tale of Two Cities.' 'Great Expectations' followed in the same paper (1860). In 'All the Year Round' also appeared a series of disconnected sketches, called 'The Uncommercial Traveller' (1868). 'Our Mutual Friend' (1865) was the last great serial work which Dickens lived to finish.

The first number of Dickens' last work, 'The Mystery of Edwin Drood,' was issued on 1 April 1870, and only three numbers had appeared at the time of his death. Three other numbers were published from the MSS. he had left, but the story remained unfinished.

Dickens married in 1838 the daughter of George Hogarth, a musical writer and critic. In the same year he openly avowed the authorship of Pickwick. He had a decided taste for theatricals, and was a successful amateur performer. He frequently turned his talent in this way, and as a public speaker, to charitable purposes. He was also an admirable reader, and during the last 15 years of his life made frequent reading tours in which he gave semi-dramatic readings from his own works to appreciative audiences. He visited the United States a second time in 1867–8 on a reading tour. The enthusiastic reception he met with caused him somewhat to modify the severe opinions he had expressed in his 'American Notes,' and a sort of apologetic note was prefixed to the next edition of them, with the desire expressed that it should accompany all future editions. He was buried in Westminster Abbey. See Forster, 'Life of Dickens' (1872–4); Fitzgerald, 'The History of Pickwick' (1891); Kitton, 'The Novels of Charles Dickens' (1897); and 'The Minor Writings of Charles Dickens' (1900); Gissing, 'Charles Dickens: a Critical Study' (1898). In 1880–2 his eldest daughter edited his letters.

Dickens, Charles, English editor: b. 1837; d. Kensington, England, 20 July 1896. He was the eldest son of the preceding; was educated at King's College, Eton, and at Leipsic; became assistant to his father as editor of 'All the Year Round,' and subsequently chief partner in a printing firm. He edited a 'Life of Charles Mathews'; 'The Dictionary of London'; 'Paris and the Thames'; and a complete edition of his father's works.

Dickens, Mary Angela Evans, English novelist: b. 1838. In 1861 she married the eldest son of Charles Dickens. Her best-known novel is 'A Mere Cipher' (1893). She has also written: 'Cross Currents' (1892); 'Valiant Ignorance' (1894); 'Some Women's Ways,' a volume of short stories; 'Prisoners of Silence' (1895); 'Against the Tide' (1897); 'On the Edge of a Precipice' (1899); 'The Wastrel' (1901).

Dick'erman, Lysander, American Egyptologist: b. Bridgewater, Mass., 1830; d. Boston, Mass., 13 Dec. 1902. He was educated at Brown University and Andover Theological Seminary, and entered the Congregational ministry in 1858. He held various pastorates in New England, Illinois, and California, and in his later years devoted much attention to Egyptology, publishing: 'The Egyptian Deities' (1885); 'The Hittites of the Bible' (1889); 'The Fayam' (1892); 'Mariette Bey's Monument of Upper Egypt' (1900).

Dickey, Charles Andrews, American Presbyterian clergyman: b. Wheeling, W. Va., 25 Dec. 1838. He was educated at Washington College, Pennsylvania; studied at the United Presbyterian Theological Seminary 1858–61; and was pastor of the United Presbyterian Church, Allegheny City, Pa., 1861–9; the First Presbyterian Church, St. Louis, 1869–75; Calvary Presbyterian Church, Philadelphia, 1875–93; and has been pastor of the Bethany Presbyterian Church, Philadelphia, from 1893. He was moderator of the Presbyterian General Assembly 1900–1, and during his pastorate in Philadelphia was prominently associated with all the benevolent operations of his Church.

Dickie, George William, American engineer: b. Arbroath, Scotland, 17 July 1844. He studied engineering in his father's shipyard, and with the North British Railway Company, and came to the United States in 1869. He was engaged in steamship work on the Pacific coast, designed machinery for the Comstock mines, became president of the Union Iron Works in 1883, giving especial attention to naval work. He has written: 'Pumping and Hoisting Works' (1876).

Dickins, John, American Methodist clergyman: b. London, England, 24 Aug. 1747; d. Philadelphia, Pa., 27 Sept. 1798. He was educated at Eton and emigrated to America prior to the American Revolution. Becoming a Methodist in 1774, he entered the ministry, becoming one of the most notable preachers of his day. He was instrumental in founding Cokesbury College, Maryland, and the Methodist Book Concern.

Dickinson, Anna Elizabeth, American orator, novelist, and playwright: b. Philadelphia 28 Oct. 1842. At the outbreak of the Civil War she became known as a speaker, and under the stimulus of the great events became an orator of great power and persuasiveness, who created by her youth, real pathos, and brilliant rhetoric the greatest enthusiasm wherever she was heard. She was called the "Joan of Arc" of the War. Some of her books are: 'What Answer' (1868), a novel; 'A Paying Investment' (1876); 'A Ragged Register of People, Places, and Opinions' (1879). She was the author of two plays of excellent dramatic quality: 'Anne Boleyn,' and 'Marie Tudor' (1875), in which she played the title roles.

Dickinson, Charles Monroe, American author: b. Lowville, N. Y., 15 Nov. 1842. He was admitted to the bar in 1865, and practised law until 1877 in Binghamton and New York; in 1896 he was elected presidential elector, and has been United States consul-general to Turkey from 1897. He has published a book of poems entitled 'The Children and Other Verses' (1889), the title poem of which has received remarkable popularity; and a 'History of the Dickinson Family' (1885).

Dickinson, Daniel Stevens, American lawyer: b. Goshen, Conn., 11 Sept. 1800; d. New York 12 April 1866. He was admitted to the

New York bar, where he soon became prominent; was elected to the State Senate in 1836, and became a leader in the Democratic party, which made him lieutenant-governor in 1842, and in 1844 sent him to the United States Senate. There he became known for his pro-slavery and States-rights proclivities, and was made chairman of the Finance Committee. He was brought forward as a candidate for the presidency in 1852, but without success. He spent the later part of his life at Binghamton, N. Y., in the practice of his profession.

Dickinson, Donald McDonald, American lawyer: b. Port Ontario, N. Y., 17 Jan. 1846. He was graduated at the law department of the University of Michigan in 1866, and began the practice of law in Detroit, where he rapidly rose to a foremost position at the bar; and later practised in Washington, D. C. He was conspicuous in politics as a Democrat; was secretary of the Democratic State Central Committee, which managed the Greeley campaign in 1872; withdrew from the Democratic party, but was won back by Mr. Tilden; and was chairman of the Democratic National Committee in 1876; and a member of the committee in 1884–5. He was postmaster-general of the United States in 1887–9; chairman of the Democratic National Campaign Committee in 1892; and senior counsel for the United States before the Joint High Commission on the Bering Sea claims, under the Fur Seal Arbitration in 1896–7.

Dickinson, Emily, American poet: b. Amherst, Mass., 10 Dec. 1830; d. there 15 May 1886. Living the life of a recluse, she wrote much verse in forms peculiar to herself, but she published almost nothing; although the few pieces that appeared attracted much attention. In 1890 a collection of her poems was issued which received warm praise from competent critics; another in 1892; and her 'Letters' in 1894.

Dickinson, John, American political writer and statesman: b. Maryland 13 Nov. 1732; d. Wilmington, Del., 14 Feb. 1808. He wrote a series of state papers: 'Address to the Inhabitants of Quebec'; 'Petitions to the King'; 'Address to the Armies,' that had great influence in their day. He was the author of 'Letters from a Pennsylvania Farmer to the Inhabitants of the Colonies' (1767); and 'Essay on Constitutional Power of Great Britain over the American Colonies' (1774). Dickinson College at Carlisle, Pa., was named in his honor.

Dickinson, Jonathan, American Presbyterian clergyman: b. Hatfield, Mass., 22 April 1688; d. Elizabethtown, N. J., 17 Oct. 1747. He was graduated at Yale College in 1706, and soon afterward was installed as pastor of the Presbyterian congregation in Elizabethtown, N. J., which relationship continued until his death. After the separation of the New Jersey churches from the synod of Philadelphia in 1741, it was determined to establish a collegiate institution in the former colony, and a charter for the College of New Jersey (now Princeton University) was obtained. The first classes were opened in Elizabethtown, and Dickinson was elected president.

Dickinson, Martha Gilbert, American poet: b. Amherst, Mass. She is a niece of Emily Dickinson (q.v.), and was married to Alexander E. Bianchi 24 July 1903. She has published: 'Within the Hedge'; 'The Cathedral and Other Poems.'

Dickinson, Mary Lowe, American educator and author: b. Fitchburg, Mass., 1839. She was married to John B. Dickinson, a New York banker, and after his death taught in schools in Boston, Hartford, and New York, being for some time principal of the Van Norman Institute in the last-named city. She edited the 'Silver Cross' magazine for 10 years, and is now the editor of 'Lend a Hand.' She has published several volumes of fiction and a collection of poems.

Dickinson College, a coeducational institution in Carlisle, Pa., founded in 1783, under the auspices of the Presbyterian Church. The government of the school was changed somewhat in 1833, and it came under the charge of the Methodist Episcopal Church. In 1902 the number of students enrolled was about 490, and the number of volumes in the library was 35,000.

Dickson, Frank, English artist: b. near Chester, England, 1861. He was educated at Liverpool College, and studied art in the Royal Academy Schools. He has exhibited often in the Royal Academy as well as in many English galleries, and in Australia.

Dickson, Samuel Henry, American physician: b. Charleston, S. C., 20 Sept. 1798; d. Philadelphia 31 March 1872. He was graduated at Yale College in 1814, and immediately after commenced the study of medicine in his native city. He was instrumental in the establishment of a medical college in Charleston, and on its organization in 1824 he was called to the chair of institutes and practice of medicine. In 1858 he was called to the chair of practice of medicine in the Jefferson Medical College, Philadelphia, which he held till his death. He was author of 'Manual of Pathology and Practice of Medicine'; 'Elements of Medicine' (1835); 'Essays on Pathology and Therapeutics' (1845); 'Essays on Life, Sleep, Pain, etc.' (1852). It is a fact worthy of note that he delivered the first temperance address ever heard south of Mason and Dixon's line.

Diclinous, dī-klī'nŭs or dī-klī'nŭs, a Linnæan term for flowers possessing stamens or pistils only — *Monœcia, Diœcia,* and *Polygamia.*

Dicotyledon, dī-kŏt ĭ-lē'dŏn, a plant having two cotyledons or seed-leaves, that is, primordial leaves, contained in the embryo. The majority of flowering plants have this structure. When therefore seed is sown, in most cases the future plant first appears above the ground as a tiny two-leaved existence, and in certain cases the next pair of leaves which appear, and all the future ones, are of a different structure from the first. The primordial pair of leaves are the two cotyledons. Their use in the economy of nature is to shelter the ordinary leaves situated inside. In the plural the highest class of the vegetable kingdom, containing orders of plants with the structure of seed just described. It is a natural division and has other characteristics than that now mentioned; specially, new wood is added to the old externally, whence these plants are very often termed exogens. The dicotyledons comprise at least two thirds of all known plants.

Dicrot'ic Wave, a double beating, as in the human pulse. Each pulse-wave begins with an ascent corresponding to the systole of the heart. This ascent usually forms, as registered by the sphygmograph, an unbroken line until the apex of the curve is reached and the descent commences. The descending curve is marked by several minor waves, one of which being quite pronounced is known as the dicrotic wave, and is probably due to a reflection of the arterial tension on the periphery.

Dicta'tor, an extraordinary magistrate of ancient Rome, first appointed 501 B.C. At first no one was eligible to the office who had not been previously a consul. The power of naming a dictator, when an emergency arose requiring a concentration of the powers of the state in a single superior officer, was vested by a resolution of the senate in one of the consuls. A plebeian dictator was first appointed 356 B.C. The dictatorship was limited to six months, and the person who held it could not go out of Italy. The dictator had the power of life and death, and could punish without appeal. All the other magistrates were under his orders. He had 24 lictors, double the number allowed to a consul. Such were the dictators appointed to carry on the government of the state in special emergencies; but dictators were often appointed for temporary purposes, especially during the absence of the consuls. The object of these temporary appointments was generally to secure the discharge of some function which could only be lawfully performed by the first magistrate, as the holding of the comitia (or meetings) for the elections. The last dictator entrusted with the government of the state under the republic was appointed 216 B.C., the last temporary dictator 202 B.C. The office was revived by Sulla 82 B.C., and afterward held by Cæsar 48 B.C., but in these cases the legal restrictions were not regarded, and the office bore no resemblance but in name to the ancient dictatorship. It was abolished during the consulship of Antonius, 44 B.C. In more modern times usurpers have made themselves dictators. The rulers of Paraguay bore the title of dictator for a number of years, and those of other Spanish-American countries have done so from time to time.

Dictatorships in Latin-America. In Mexico, since the establishment of independence, there have been 10 acknowledged dictatorships, namely, those of Gen. Antonio Lopez de Santa-Anna, 1841 to 1842; Gen. Nicolás Bravo, 1842 to 1843; Santa-Anna again, in 1843; Gen. Valentin Canalizo, 1843 to 1844; Gen. Manuel María Lombardini, 1853; Santa-Anna again, 1853 to 1855; Gen. Rómulo Díaz de la Vega, 1855; Gen. Martin Carrera, 1855; Gen. Juan Alvarez, 1855; Gen. Ignacio Comonfort, 1855 to 1857. The "usual alternations of anarchy and military rule"—the long period of internecine strifes, during which one president after another was summarily deposed—drew to an end about 1876. Gen. Porfirio Diaz succeeded Tejada in May 1877. He was re-elected in 1884, and since that time has remained at the head of the government. In Paraguay, three years after allegiance to Spain was renounced, the congress in October 1814 decided to make Doctor (of theology) José Gaspar Rodriguez Francia dictator for three years. Before the expiration of his term of office, another congress decreed that his dictatorship should be perpetual. He died 20 Sept. 1840. Francisco Solano Lopez (10 Oct. 1862 to 1 Mar. 1870), though constantly referred to as a dictator, was officially known as "president of the republic." By an act of congress, 16 Oct. 1862, he was made "president of the republic for 10 years," his father, Carlos Antonio Lopez, having been president during the 18 years immediately preceding, that is, from 1844 to 1862. In Bolivia there was at first no need to employ the word dictator, simply because the constitution of that country, framed by Bolivar and accepted without change or even debate by the congress at Chuquisaca, 25 May 1826, conferred ample dictatorial powers upon a "president" who should hold office for life; nevertheless the higher title was repeatedly assumed or conferred (see BOLIVIA for list of presidents and dictators). In Colombia (when it included New Granada, Venezuela, and Ecuador), we find, first, military dictatorships established before 1827 by Paez in Venezuela and by Mosquera in Ecuador; and then the dictatorship of Bolivar, who assumed absolute sovereignty in 1828 over the entire Colombian federation. Almost immediately afterward the federation broke up. The racial aversion to such steady co-operation as the situation called for was intensified by extravagant theories touching the so-called sovereignty of each individual citizen. Thus, it was not merely true that the 21 wretched "sovereign states" of Venezuela could repudiate pecuniary obligations or violate treaties with impunity; that any of the states of New Granada could nullify a law of the federal congress; but it has been well said that every man fancied that he was governed by a "higher law" inherent in himself, and "when he declared against the government he was not a traitor, but only a revolutionist, asserting his inherent right as a 'sovereign.'" In Colombia, from 1830 to 1861, there was a revolutionary outbreak on an average every second year; Ecuador generated a revolution and a new constitution every four years; Venezuela was even more distressed by anarchy. Acceptance of a military despot seemed to be the only escape from these intolerable conditions. The revolutionist Mosquera declared himself dictator of the diminished Colombia in 1867. In Venezuela, as a separate country, the first ruler is sometimes called dictator, sometimes president; he was both by turns, and repeatedly. Similar versatility was exemplified in the troubled lands from Mexico to the far South: as a Venezuelan fashion it easily survived its forceful exponent, Paez. Three short-lived dictatorships were set up in succession just before Crespo entered Caracas in 1892. In Ecuador, the first Flores called a convention (1843) which expressed the temporary desire to entrust him with a magistracy so far above all others that it is superior even to the laws themselves. Again, on 2 April, 1882, President Veintemilla seized power as a dictator and held it for a year. In Peru, Gen. Bolivar was supreme dictator, both during and after the struggle for independence, his license having been granted by the revolutionary congress of 1824 and confirmed in 1826. In Argentina, Juan Manuel Rosas accepted (7 March 1835) an almost unrestricted dictatorship which was offered to him in the hope that he would restore order. He reigned "in a horrible manner, like a madman" up to the day of his defeat, 3 Feb. 1852. In Brazil, the

first national congress convened on 15 Nov. 1890, after the expulsion of Dom Pedro II. One year later (Nov. 1891) President Fonseca proclaimed himself dictator on the strength of an invitation of officers of the Brazilian army; but his navy turned its guns on him, and he resigned. In Chile, there have been fewer revolutions, more frequent instances of submission to the mandates of a privileged upper class; yet at the beginning of 1891 President Balmaceda broke with national traditions, to adopt those of the continent of South America: he announced that he was dictator, when he was, in fact, only a party leader; he declared himself to be in favor of martial law, and by superior force he was crushed (see CHILE). In the history of Uruguay, the word "dictator" is not prominent, though the irresponsible government of Artigas, a *Gaucho* ("Rough Rider") chief, bred disorder after 1814, and comparative stability was first assured after 1870, when the Paraguayan war ended. In Costa Rica (q.v.) several of the chief executive officers have been called dictators, with an intention somewhat less offensive because the policy of the government is conceded to have been, in certain respects, positively commendable. For the other republics of Central America and Santo Domingo, our readers are referred to the articles dealing with those countries, in which special circumstances are explained. The exercise of dictatorial powers by dictators without the name — rulers who had, or have, the title of president merely — will be found under SOUTH AMERICA.

MARRION WILCOX,
Authority on Latin-America.

Dictionary (Low Latin *dictionarium*, first used in the 14th century; from *dictio*, post-classical synonym for *verbum*, word). The various applications of the term, general and special, are so familiar that a detail would be of no service. Of its synonyms, it may be said that the Greek word "lexicon" is customarily restricted to a dictionary of ancient or Oriental languages, with definitions, etc., in the language of the supposed reader; "glossary" and "vocabulary" to dictionaries of the terms used in the special works to which they are attached. A glossary (called by the Germans *idioticon*, by the Italians *vocabolario*) is a defined list of unusual, antique, or foreign words; a vocabulary, in classical works sometimes called an index, belongs to a book in or text-book of a foreign language, and renders the foreign words into the reader's language, or the exercises of the latter into the foreign.

Functions.— The variation of kind with the variation of users and origin, common to all literature, is well exemplified in dictionaries. The original dictionary was a simple definer of words which a cultivated reading class was supposed not to know,— foreign, provincial, technical, obsolete, etc.; the modern dictionary of its own language attempted to exclude nearly all but the accepted vocabulary of current literature,— that is, what people knew already,— or at least what would be needed for such reading; the later ones increasingly include the means of understanding everything ever printed in a language. Two classes only, for obvious reasons, are still excluded (one of which the older ones gave), by reason of the change in audience from men to women and children: gross words, except a few too important philologically to be spared; and argot. The "abridged" dictionaries for many years, with ludicrous logic, excised the difficult words and retained the familiar ones; the first to exercise common-sense and reverse this plan was Jabez Jenkins in his wonderful "vest-pocket lexicon," whose near 30,000 words contained almost all the unusual ones and the pronunciational cruces. The attempts to draw a line in full dictionaries are now recognized as injudicious: that a word or form of a word has gone out of use is the very reason it should be defined or at least cross-referenced. An incomplete record of the language is by so much unserviceable. Part of the exclusions resulted from the growth of a half-educated middle class who looked to it as a standard of taste. The French Academy at first omitted all technical terms, and all words assumed below its standard of elegant usage; but as this made the book half useless, and the omissions were credited to the Academy's ignorance or carelessness instead of its fastidiousness, it could not be maintained. Recent dictionaries attain the same end by marking words as "obsolete," "little used," "provincial," "colloqnial," "slang," "vulgar," etc. The attempted arbitrament of pronunciations, though inevitable (being among the chief services for which they are consulted), will always remain a battle-ground embarrassing even to the umpires. Still more important, however, is a dictionary's value for the historical development of a language. No dictionary fulfils its best purpose which does not, as far as possible, trace the varying significations from their sources, with their development by metaphor or technical use; and any arrangement which obscures this is vicious; whatever temporary convenience may be subserved. As the validity of this development depends on citation of passages, these should be full, otherwise we have only the arbitrary assertion of the compilers. Back from even this lie the original etymologies of the words, which are of great value and even more interest; and the best dictionaries give them with their affiliations in other languages. All the irregular grammatical forms, and the particles by which words are inflected.— a sufficient grammatical apparatus for correct usage,— should be given as a matter of course. Syllabifications, divisions, etc., should also be indicated: in a word, the dictionary is a proof-reader's vademecum, and must contain all requisite material for him to use.

Arrangement.— The first condition of usefulness being that the items shall be easily found, no arrangement is tolerable except an alphabetical one, in all languages where the inflections are mainly terminal or after a consonant initial. This arrangement, however, may be used only in a key, making feasible other classifications for the main body; as in Roget's well-known 'Thesaurus' of synonyms, where the grouping is by ideas, in parallel column with the reverse ideas. This would be a very useful addition to the meagre lists of synonyms given in the large dictionaries; but it would need great labor and almost impossible accuracy of cross-referencing, as the group heads must be referred to from each word in its alphabetical place. A very useful variant is in the lists of technical terms of arts and sciences given under each main head in the 'Standard Dictionary.' Rhyming dictionaries are arranged alphabetically under the terminations. In etymological

dictionaries, attempts have been made to alphabetize by roots; but as no two scholars ever agree on the roots, the finding is largely guesswork, unless with a full alphabetical key, and scholars condemn the plan. In Semitic languages the arrangement is usually by roots. It was this necessity of arranging Volapuk dictionaries, owing to the prefix inflection involving a search in three or four places for one word, which as much as anything else prevented that "language" gaining favor. The arrangement of Chinese characters is almost incapable of any readily intelligible system, and is not settled by sinologists.

History.— The first dictionaries were used by the Assyrians and Babylonians, to explain not words, but signs. The ancient ideographs, when largely displaced by syllabified or alphabetic signs with phonetic values, rapidly became unintelligible; and syllabaries were therefore compiled, to define them in terms of the latter. The old Sumerian language, however, seems not then to have become "dead," being preserved by the colleges of priests for religious use; and foreign languages were learned from foreigners. These were inscribed in vertical columns, on clay tablets; they have been found in the great library of Asurbanipal (Sardanapalus — 668–626 B.C.), at Nineveh, the source of our chief knowledge of Mesopotamian culture. Much the same sort of syllabaries seem to have been used by the Chinese and Japanese.

The ancestry of our own dictionaries, however, is Greek. Here we observe the usual progression from the special to the general. The typical modern dictionary is a complete or representative vocabulary of a language, present and historical, with definitions in its own or some foreign tongue; its object being to interpret either the meaning of the foreign tongue or the bygone part of its own, or the usages and history of the latter. But neither of these was thought of by the ancients. The small upper and priestly class settled their own usages of language, there was no half-educated reading populace relying on books for correct form, there was no foreign literature they cared to read, and foreign conversation they learned from conversation. Their first dictionaries were the same as our special vocabularies. The oldest surviving one, by Apollonius of Alexandria in Augustus' time, was a glossary of Homer's words — probably the oldest of all kinds if we had them, Homer being the common text-book of Greece; others were of ambiguous, corrupt, barbarous, foreign, or dialectic phrases in the tragic and comic poets,— phrases Attic, Lacedæmonian, Cretan, Rhodian, Italian, Phrygian, etc.; others of technical terms in cookery, a fascinating subject to the Greeks; others of drinking vessels, of the cries of animals, of synonyms, etc. Besides glossaries of Homer, there were others of Plato, the Ten Attic Orators, Hippocrates, etc. All of these, so far as preserved,— unhappily, very few of them are preserved, and Athenæus in the 2d century gives the names of 35 lost to us,— are of priceless value both for words and antiquities. On a larger scale were the Onomasticon ("word-book") of Julius Pollux, arranged topically in 10 books, which has survived; and a great lexicon, now lost, written by Helladius of Alexandria about 400 B.C. Of others may be noted an etymological dictionary by Orion of Thebes about 450, the first we have,— for Varro's essays in Roman etymology can hardly be called a dictionary; a dialectic and local one by Hesychius of Alexandria, in the 4th century; and one of words similar in sound, but unlike in meaning, by Ammonius of Alexandria. Coming down to the Middle Ages, the most famous is that of Suidas, of unknown date or place, but probably about the 10th century; it is a slovenly compilation of words, names, and places, but extremely valuable from its matter, not to be had elsewhere. Overleaping some centuries and their works, we come in 1572 to the mightiest of all, the tremendous 'Thesaurus Græcæ Linguæ' of the famous French scholar and printer, Henri Estienne or Stephanus (q.v.), Geneva, 4 vols., folio, a work gigantic not only in size but in scholarship; it was last reprinted by Didot at Paris, 1831–65, ed. Dindorf, 9 vols. folio, 9,902 pages. All the mediæval and modern lexicons till the 19th century were Greek into Latin; the first Greek-English one was not till 1814, by John Pickering, and that was not finished; the first complete one was by John Jones, 1823, London. For many years the only general one on the market has been the Liddell & Scott, revised by Drisler, in its various editions. This, however, is confined to classic and early-empire forms, to common nouns, and to book words; and leaves need for several additional works. Later and mediæval Greek has been admirably covered by the lexicon of E. A. Sophocles, revised 1887 by J. H. Thayer; and a three-volume lexicon entirely devoted to the vast wealth of forms furnished by the inscriptions is in progress. Smith's dictionaries of antiquities and proper names are gone by, but the only ones in English; in German there are Pape's 'Greek Proper Names' (Griechische Eigennamen) 1875–90. There is one of modern Greek by Contopoulos, Athens, 1889; and there are special glossaries, New Testament and of various great authors, English-Greek, Yonge, revised by Drisler, latest edition 1893.

Less needful are details of Latin dictionaries, though they have been very plentiful; in the Middle Ages they were the daily necessity of all cultivated existence. They began much later than Greek: even the etymological treatise of the great M. Terentius Varro, Cicero's contemporary, preserved only in fragments, can hardly be called a dictionary; the first real one is of Verrius Flaccus under Augustus. One of Gutenberg's volumes' was the 'Catholicon' or 'Summa' of Johannes de Janua (Giovanni Balbi), 1460. The monk Calepino published in 1502 at Reggio a Latin-Greek lexicon, which was so famous that for many years all dictionaries were called "calepinos"; in 1575 it was made a polyglot of Italian, French, and Spanish as well, and in 1590 extended to all languages, and many times reprinted. Robert Estienne, father of Henri above, published in 1531 at Paris a great 'Thesaurus Linguæ Latinæ,' not supplanted till Forcellini's 'Totius Lexicon Latinitatis' in 1771, at Padua. All these were Latin into Latin, except that the latter had definitions also in Greek and Italian. A new edition, largely supplemented, Prato, 1858–79, forms the greatest Latin dictionary ever published. The first Latin-English dictionary was the 'Promptorium Parvulum' of a Norfolk monk, Galfridus Grammaticus, compiled 1440,

printed 1499; the first important one was by Sir Thomas Elyot, London, 1538. In the 18th century Robert Ainsworth's was for many years the only popular one (London, 1736). At present the two general popular ones are White & Riddle's (London, 1880), and Harper's (Andrew's Freund, revised by Lewis and Short, 1886). The great German-Latin one is Georges', 4 vols., Leipsic, 1880–5. The English-Latin are Smith & Hall, 1890; White & Riddle, 1869. A giant 'Thesaurus' was started in Leipsic, 1900, to outrank any other Latin lexicon in existence; it is to be edited by the greatest German scholars, under the supervision of the five great German academies, and has not yet finished the letter A. The great dictionary of mediæval Latin is Du Cange's, 1733–6, re-edited Paris 1882–8, 7 vols.

For modern European languages into English and *vice versa*, the following are standard: French — Smith, Hamilton & Legros, 1891; Spiers & Surenne, 1891; Gasc, 1895. German — Thieme-Preusser, 1898; Flügel, 1891; Lucas, 1854–68; Whitney, 1877, valuable for etymology; Adler's, 1875, still unequaled for discrimination of synonyms. Spanish — Velazquez, revised by Gray and Iribas, 1901 (the old Velazquez's Seoane revised with a great new technical vocabulary). Portuguese — Lacerda, 1871; Michaelis, 1894; Valdez, 1879. Italian — Baretti, 1877; Meadows, 1869; James and Grassi, 1884; Millhouse, 1899. Dutch — Calisch, 1890. Danish — Ferrall, Repp & Rosing, 1873. Swedish — Wenström & Lindgren, 1889; Nilsson, Widmark & Bollin, 1889. Norwegian — Geelmuyden, 1886. Russian — Alexandrov, 1879. Turkish — Redhouse, 1880. Polish — Baranowski, 1884. Hungarian — Bizonfy, 1878–86.

The great foreign dictionaries of their own languages, corresponding to the 'Century Dictionary' or the 'New English Dictionary' of our own, are: French — Littré's, 4 vols., 1863–72, supplement 1878–82. Larousse's rich work is an encyclopædia. German — Jacob and Wilhelm Grimm, etc., the first volume published 1854, and the work is still unfinished. The brothers Grimm died 1859–63, and a succession of scholars have carried it on, but the parts appear slowly. Italian — Tommaseo and Bellini, four volumes in eight, 1861–79. Castilian Spanish — Dictionary of the Spanish Academy; Donadiu and Puignau, 1890–95; Cuervo's unfinished work, 1866–94. There is also a two-volume dictionary of Catalan, by Lobernia and Esteller. There are of course many other smaller but valuable etymological and historical dictionaries. Of other languages may be mentioned: Portuguese — Caldas Aulete, 1881. Provençal into French — Mistral, 1886. Sardinian into Italian, and *vice versa*, Spano, 1851. Dutch — Dale, 1885–9; Franck, 1884–92. Swedish — Kalkar, unfinished. Icelandic — Cleasby and Vigfusson, 1874. Welsh — Evans, 1887, unfinished. Irish — Foley, 1855; O'Reilly, supplement by O'Donovan, 1864. Russian — Dahl, 1862–73. Polish — Rykaczewski, 1866. Slavonian — Miklosich, 1886. Turkish into Arabian and Persian, Zenker, 1866–76. Chinese into Latin, De Guignes, 1877; into French and Latin, 1869. Annamese — Pauthier, in Chinese characters with pronunciation in Chinese and Annamese.

Though Oriental and ancient, their close connection with our racial and religious ancestry and current problems makes Sanskrit and Hebrew worth noting separately. For the former, the great English works are by Monier-Williams: English-Sanskrit, 1851; Sanskrit-English, 1872. Hebrew, Fürst, 1867.

English lexicography on its own language begins very humbly, with John Bullokar's 'English Expositor,' 1616. More famous was Henry Cockeram's, 1623, which passed through nine editions up to 1650. Blount (1656), Philips (1658), and Coles (1677) succeeded these; but the first attempt at a thorough collection was Nathan Bailey's (1721.) This gave etymologies, marked accents, and remained the sole possessor of the field till Johnson's appeared in 1755; and was reprinted over a quarter of a century longer from its handy size, the 24th edition dating 1782. Johnson's, however, is the first of any importance from a scholar's point of view. The etymologies are superseded, but he was the first to make a dictionary something like a history of the language, with full (even over-full) illustrative examples, precise definitions, and attention to the form. It has been reprinted as late as 1866, but for popular use is superseded even in England by the great American dictionaries, and for scholars by special works. It did not mark pronunciation except by accents, like Bailey's. The first to enter on this unending task was Kenrick (1773); then came Perry (Boston, 1777); Thomas Sheridan (1780), the elocutionist, father of the great dramatist; Walker (1791), of immense vogue in its time and still cited as an authority, though entirely out of date; Smart (1836), based on Walker; all making their first claim as arbiters of elegant taste. Richardson (1836) was primarily for etymologies. Ogilvie's 'Imperial Dictionary' (1850, new ed. 1883) was the first of the great encyclopædic dictionaries; the 'Century Dictionary' was at first intended only as a slightly revised reprint of Ogilvie, but swelled into the magnificent work so well known. Previously, another English work of the sort had appeared, Hunter's, 1879–88. But the one monumental English dictionary is to be the 'New English Dictionary on Historical Principles,' edited by James A. H. Murray and Henry Bradley, greatly assisted by the late Fitzedward Hall, from matter collected by the Philological Society. It has reached the letter R at this writing, and will take several years to complete; and will form an absolute history of all English words and meanings. Noah Webster's first dictionary was in 1806, but the first edition of his epoch-making 'American Dictionary' was in 1828. This has become the 'Webster's International Dictionary' of 1890; always connected with Yale College scholarship, through Webster's son-in-law, Chauncey A. Goodrich, and later through Noah Porter. Webster was the founder of American lexicography, and by his enthusiasms and original ideas has left a permanent impress on American usages, even where his pet notions have been discarded. His work brought out its chief rival for many years, 'Worcester's Dictionary' (1860), by a scholar who had assisted him but disliked his innovations, and wished to substitute elegant usage for what he thought Webster's barbarisms. It had great influence for a generation, and has a tenacious tradition yet. The 'Standard Dictionary' (1893–5) is a medium between the com-

pression of Webster and the encyclopædic magnitude of the 'Century.'

Among special dictionaries may be named Jamieson's 'Etymological Dictionary of the Scottish Language,' 4 vols., 1870–82, with a supplement 1887; Wilson's 'Glossary of British India,' 1851, and Yule & Burnell's 'Anglo-Indian Words and Phrases,' 1886; Wright's 'English Dialect Dictionary,' about half finished; Bradley's 'Middle English Dictionary,' 1891; Taylor's 'Words and Places,' several revisions, and Blackie's 'Dictionary of Place-Names,' both etymologies of names; Bartlett's 'Dictionary of Americanisms' (1877), much too inclusive, and Farmer's 'Americanisms, Old and New' (1889); Roget's 'Thesaurus' of synonyms, last edition 1892.

Dictys (dĭk'tĭs) **of Crete,** a follower of Idomeneus in the Trojan war, whose name is attached to a professed journal of the leading events of the contest, which has come down to us in Latin prose, under the title 'Ephemeris Belli Trojani.' An introduction relates how the narrative, inscribed in Phœnician characters on bark-paper, was found in a coffer of tin in Dictys' tomb, which had been burst open by an earthquake in the reign of Nero, and how the emperor caused it to be translated into Greek; this is accompanied by a letter from one Quintus Septimius, who claims to have prepared the condensed Latin version that follows. This dates probably from the 4th century A.D., and though of no intrinsic value, was a chief source of the romances of the Middle Ages. The best editions are those of Dederich (Bonn 1832 and 1837), and Meister (Leipsic 1872).

Dicye'midæ, a family of very lowly multicellular organisms, parasitic in habit. They are found in cuttle-fishes, while related organisms known as *Orthonectida* occur in a brittle-star and in a nemertean worm. The largest species of the genus *Dicyema* measures five sevenths mm.; the smallest is 10 times less. These organisms hardly rise above the level of the embryonic gastrula, and some seem hardly to attain it, but it is still uncertain how much of this simplicity is primitive, and how much the result of degeneration.

Dicyn'odon, a genus of fossil reptiles occurring in a sandstone, supposed to be of Triassic age, in southern Africa and India. The principal remains yet found, the bones of the head, indicate a gigantic type between the lizards and turtles. The anterior portions of the jaws appear to have been altogether toothless, and they form a kind of beak, which was probably sheathed in horn. The lower jaw has no teeth; but each superior maxilla carries an enormous tusk-like tooth, growing from a persistent pulp. Eye orbits very large, cranium flat, with nostrils divided as in lizards. Order, *Anomodontia.*

Didactic Poetry (from Gr. διδακτικός, pertaining to teaching), has as its object the instruction of the ignorant. In the early ages of Greek literature there was no prose writing. Hesiod taught husbandry and theology in verse, Solon harangued in hexameters. Ever since that time verse has to some extent been used as a vehicle of teaching. The early Ionian philosophers, like Xenophanes, expounded their system in poetry, and, in the later days of the Roman republic, Lucretius, in the finest didactic poem that was ever written, unfolded the theories of Epicurean materialism. Virgil wrote the 'Georgics' to teach the veterans of Augustus the art of agriculture, and Horace in his 'Art of Poetry' embodied for young Roman poets the Greek principles of dramatic writing, while Ovid set forth systematically the 'Art of Love.' Vida, the Italian, Boileau, the Frenchman, Pope, the Englishman, also wrote in verse an 'Art of Poetry.' English poets have been much inclined to didactic poetry. Darwin's 'Botanical Garden' is a treatise on the Linnæan systems of botany. The longer poems of Cowper are moral lectures. Dyer's 'Fleece' is the shepherd's guide, and even the 'Shipwreck of Falconer' may be looked upon as a manual of seamanship.

Didel'phia, a group of mammals comprising the Marsupials (q.v.), so called in reference to the double condition of the generative organs, in the female. Compare Monodelphia, and see Metatheria.

Diderot, Denis, dē nē dēd-rō, French philosopher: b. Langres 5 Oct. 1713; d. Paris 31 July 1784. 'Philosophic Reflections' — burned by the hangman and therefore widely circulated — and 'A Skeptic's Walk' (1747), were part of a warfare against the Church. In the compilation of the 'Encyclopédie' Diderot bore the main burden. He wrote all the articles on technology and industries, besides many of those on points of philosophy, and even on physics and chemistry. Further proof of his versatility is seen in the admirable reports he wrote (1765–7) of the art expositions at the Paris Academy. He wrote some dramas, but none of them possess any great merit. On the other hand, his novel, 'The Nun,' and his dramatic dialogue, 'Rameau's Nephew,' are wonderfully effective pictures of the corrupt society of the time. His little sketches, 'Little Papers,' are pearls of kindly humor and of witty narrative.

Diderot and the Encyclopedists, a literary study by John Morley, published 1890. This examination of the life, the work, and the influence of "the most encyclopædic head that ever existed" (as Grimm termed Diderot), and his fellow-workers, is an admirable monograph. Of all the literary preparation for the French Revolution the 'Encyclopédie' was the symbol; it spread through the world a set of ideas that entered into vigorous conflict with the ancient scheme of authority. Diderot, as the head of the movement, D'Alembert his coadjutor, Voltaire, J. J. Rousseau, Buffon, Helvetius, Holbach, Raynal, etc., with other famous persons of the day, as Goethe, Garrick, the Empress Catharine II.,— are here vividly depicted, with wide knowledge of books and of life, great skill in reading character, facility in disentangling causes and results, and broad philosophical perception of the historic position of the age. Anglo-Saxon readers find this work less one-sided than Taine's on the same subject. Appended to the book is a translation of the greater part of 'Rameau's Nephew,' Diderot's famous dialogue.

Didier, Desiderius, dē-dē-ā, or the last king of the Lombards. He was Duke of Istria, and happening to be in Tuscany in 756, when Astolphus, the previous king, died childless, immediately raised an army and laid claim to the throne. Didier was crowned and seemed to

have secured the permanence of his dynasty by marrying his daughter to Charlemagne in 770. The marriage, however, proved unfortunate; and when Charlemagne dissolved it by repudiation, the quarrel between the families became irreconcilable. Didier afterward invaded the Papal States, and made a conquest of a part of them, when Charlemagne interfered. Didier, unable to oppose him, shut himself up in Pavia, when, after a siege of a year, he was obliged to surrender at discretion.

Didier, Charles, shärl, French poet and novelist: b. Geneva 1805; d. Paris 8 March 1864. He wrote some novels designed to awaken patriotic sentiment in Italy, and to make known the struggles of the Carbonari and other revolutionists against Austrian and papal dominion. Among these were: 'Underground Rome' (1833); 'The Roman Campagna' (1842); and 'Fifty Years in the Wilderness' (1857). His lyric poems, 'Melodies' (1827), are characterized less by force than by sweetness.

Didier, Eugene Lemoine, American author: b. Baltimore, Md., 22 Dec. 1838. He edited a weekly paper called 'Southern Society' 1867–9. Among his published works are: 'A Life of Poe' (1876); 'Life and Letters of Madame Bonaparte' (1879); 'Primer of Criticism' (1883); 'The Political Adventures of James G. Blaine.'

Didier, Jules, zhül, French painter: b. Paris 26 May 1831. He studied under Cogniet and Laurens, and won the prix de Rome in 1857. Among his works are: 'Farm on the Ruins of Ostia'; 'Normandy Landscape'; 'Hunting a Hare'; 'Morning on the Borders of the Wood'; 'Agriculture'; 'Ford near Autun'; and 'Return of the Drove.'

Did'ius Sal'vius Julia'nus, Mar'cus, Roman emperor: b. about 133 A.D.; d. Rome 1 June 193 A.D. Having filled the offices of quæstor, ædile, and prætor, he was appointed commander of a legion in Germany, and subsequently governor of Belgica. Having distinguished himself in Africa and Asia Minor, he returned to Rome, and, on the assassination of Pertinax, made himself emperor by bribing the prætorian guards. He now assumed the name of Marcus Didius Commodus Severus Julianus; but, after a short reign of two months was killed in his palace by a common soldier.

Di'do, queen of Carthage. She was the daughter of Agenor (Belus); according to others, of Carchedon of Tyre, from whom Carthage received its name; others call her father Mutgo or Muttinus. Her brother was Pygmalion, king of Tyre. Her father married her to her uncle Acerbas, otherwise called Sichæus or Sicharbas. He was murdered before the altar by her brother, who was instigated by the desire of making himself master of his wealth. She therefore set sail for Africa, with all her wealth and her faithful companions. They landed on the coast of Africa, not far from Utica, a Tyrian colony. She purchased as much land as might be covered with the hide of a bull, which she cut into the thinnest possible strips, and surrounded with it a large extent of territory. Here she first built the citadel of Byrsa, and afterward Carthage. Hiarbas, a neighboring prince, paid his addresses to her. Unwilling to accept and unable to refuse the proposal, she sacrificed her life on the funeral pile. By an anachronism common with poets, Virgil attributes her death to the faithlessness of Æneas. Dido was worshipped in Carthage as a goddess.

Didon, dē'dōṅ', J. Henri, Père, French Dominican preacher and writer: b. 17 March 1840; d. 1900. He has attracted much attention for his series of eloquent Lenten sermons. Having come into conflict with his superiors because of his views about democracy, he ceased for a time to preach. His leisure was spent in preparing a life of Jesus, which should be an antidote to the skeptical 'Vie de Jesus' of Renan. This was published in 1891 under the title, 'Jésus Christ,' a book which made a great impression throughout France. He has also written 'Les Allemands' (1884).

Didonceph'alus, a monster with a double range of teeth, or a double jaw.

Didot, Ambroise Firmin, äṅ-brwäz fēr-măṅ dē-dō, French publisher: b. Paris 7 Dec. 1790; d. there 22 Feb. 1876. He was a son of Firmin Didot (q.v.) and with his brother Hyacinthe published such important works as 'L'Univers pittoresque'; 'Nouvelle biographie générale,' etc.

Didot, Firmin, French publisher, printer and type-founder: b. Paris 14 April 1764; d. 24 April 1836. He was a brother of Pierre Didot (q.v.). He was inventor of a new sort of script, and an improver of stereotype printing.

Didot, Francois, frän-swä, French printer: b. Paris 1689; d. 2 Nov. 1757. He founded the famous firm of Didot in Paris in 1713.

Didot, Francois Ambrose, fräṅ-swä äṅ-brōz, French printer: b. Paris 7 Jan. 1730; d. 10 July 1804. He was a son of François Didot (q.v.), and invented many of the machines and instruments now commonly used in the typographic art. From his foundry came the most beautiful types that, up to that period, had been used in France, and he was the first person in France who printed on vellum paper. He took the greatest care to have his editions correct. By the direction of Louis XVI. he printed a collection of the French classics for the use of the dauphin. The Count d'Artois employed him to print a similar collection.

Didot, Henri, ōṅ-rē, French type-founder: b. 1765; d. 1852. He was a son of P. F. Didot (q.v.), and early distinguished himself as a type-engraver. He then applied himself particularly to improve the method of founding types, in which he succeeded by the invention of a new founding apparatus. He called his process "fonderie polyamatype." It is more expeditious than the former mode, and the types are much cheaper.

Didot, Hyacinthe Firmin, ē-ä-săṅt fēr-măṅ, French publisher: b. Paris 11 March 1794; d. Dandon, France, 7 Aug. 1880. He was a son of Firmin Didot (q.v.), and with his brother, A. F. Didot, conducted the business of the house of Didot from 1827.

Didot, Pierre, pē-ār, French publisher and printer: b. 25 Jan. 1761; d. 31 Dec. 1853. He was a son of François Ambrose Didot (q.v.), and succeeded his father in the printing business in

1780. In the universal impulse which the arts received from the revolution he aimed at becoming the Bodoni of France, and conceived the plan of a splendid edition of the classic authors in folio, which should excel, if possible, the best editions extant. He spared no expense to adorn them with all the splendor and elegance of the arts of design, and even sacrificed a part of his property to this favorite object. His 'Virgil' (1798) was worthy of these endeavors, and still more so his 'Racine' of 1801, which the French regard as the first typographical production of any age or country. Only 250 copies of these works were struck off. Among the productions of his press, Visconti's 'Iconographie' is particularly distinguished. Didot devoted the efforts of 10 years to the improvement of the types, and caused 18 different sorts, with new proportions, to be cut, with which he printed Boileau and the 'Henriade' in 1819. Didot paid no less attention to correctness and purity of text, and perfect consistency of orthography, than to typographical beauty.

Didot, Pierre-François, pē ār frän-swä, French printer: b. Paris 9 July 1732; d. 7 Dec. 1795. He was a son of François Didot (q.v.), and distinguished himself by his bibliographical knowledge. He also became printer to Louis XVIII. He had a great share in the changes made in the character of types, and contributed to the advancement of his art. He published some very fine editions; among them the 'Voyages d'Anacharsis.'

Didron, dē'drōn', **Adolphe Napoleon,** French archæologist: b. Hautvilliers, Marne, 13 March 1806; d. 13 Nov. 1867. He began in 1844 to publish 'Annales Archéologiques,' devoted to mediæval art and antiquities, which he continued to 27 volumes. This work was completed, long after his death, by the 28th volume, which included a general index. It is a valuable storehouse of mediæval art and archæology. His chief works are a 'Manual of Christian Iconography,' translated from an ancient manuscript, and 'Christian Iconography' (1843), which forms a history of the representations of the persons of the Trinity in art, their attributes, etc.

Didun'culus, a genus of birds allied to the pigeons, and comprising only the one species, *D. strigirostris* of the Navigator Islands. This bird is of special interest as being the nearest living ally of the extinct dodo. It has a length of about 14 inches, with a glossy plumage verging from a velvety black on the back to greenish black on the head, breast, and abdomen. The large beak, which is nearly as long as the head, is greatly arched on the upper half, while the lower is furnished with two or three tooth-like indentations.

Didymæus, dĭd-ĭ-mē'ŭs, a surname of Apollo, either because he was the twin-brother of Diana, or from the double light of the sun and moon, which he lends to men. Under this name Apollo had one of the most famous of his temples and an oracle at Didyma among the Milesians. Pindar calls Diana Didyma.

Didym'ium (Greek, "twin"), a supposed metallic element, isolated from the mineral cerite by Mosander in 1842. The symbol D or Di was assigned to it, and its atomic weight was considered to be about 143. The name referred to the close resemblance between the new metal and the element lanthanum, which had been discovered by the same chemist, and in the same mineral, a short time before. Recent researches have shown that didymium is not an elementary body, but that it consists principally of two other elements, which are respectively known as neodymium and praseodymium (q.v.). This discovery renders the name "didymium" singularly appropriate for the original substance.

Did'ymus, Alexandrian grammarian and critic: b. 63 B.C. He was a prolific writer, being celebrated for a treatise on harmony. The difference between major and minor whole tone, recognized by him, is known to this day as "the comma of Didymus," and some modern composers have written in his system. He belonged to the school of Aristarchus, and was contemporaneous with Cicero. By Seneca his works were estimated at 4,000, none now extant.

Die (*Dea Vocontiorum*), the capital of an arrondissement in the department of Drôme, France, is situated on the right bank of the Drôme, at the foot of Mount Glandaz, in a wide and fertile plain. The manufactures are woolen cloth, paper, leather, and silk; there is some trade in cattle and wood, and the neighborhood produces excellent fruit, and the white wine called "Clairette de Die." The town was formerly the seat of a bishop, and previous to the revocation of the Edict of Nantes in 1685, of a Calvinistic university. Among the interesting structures of Die are the old cathedral, with granite columns from an ancient temple of Cybele, and a porch of the 11th century; the episcopal palace, the walls flanked by towers, and the ruins of a castle — all of considerable age, the triumphal arch on the road toward Gap, known as the Porte St. Marcel, portions of an aqueduct, and other Roman remains. There are several mineral springs in the vicinity.

Diebitsch-Sabalkanski, Hans Karl (häns kärl dyī-bēch-zä-bäl-kän-skē) **Friedrich Anton,** COUNT, Russian field-marshal: b. Grossleippe, Silesia, 13 May 1785; d. Kleczwo, near Poltosk, Poland, 10 June 1831. In 1707, when 12 years of age, he was sent by his father, who had served under Frederick the Great and Frederick William II. of Prussia, to the military school of Berlin, but in 1801 he quitted the Prussian service for that of Russia, entering the ranks of the imperial guard. He served with distinction in the battles of Austerlitz, in 1805; Eylau and Friedland in 1807, and, having attained the rank of captain, for five years subsequent to the treaty of Tilsit, devoted himself to the study of military science. During the invasion of the French in 1812, he served under Wittgenstein, compelled the capitulation of the Prussian general, York, became chief of staff in 1813, took part in the battle of Lützen, and later joined the corps of Barclay de Tolly in Silesia, as quartermaster-general. In June 1813 he was instrumental in bringing about the secret treaty of Reichenbach, between England, Austria, Russia, and Prussia. He fought in the battles of Dresden and Leipsic, and for his services was made lieutenant-general, at the age of 28, by Alexander. He was responsible for the march

on Paris, in the French campaign of 1814, which terminated the war, and for this he was decorated with the order of Alexander Nevskoi. He took command of the first corps upon Napoleon's return from Elba, but was later appointed adjutant to the emperor, and, having been made chief of staff, accompanied him on his journey through southern Russia, till his death at Taganrog, in 1825. Diebitsch thereupon returned to Saint Petersburg, and by his intrepid conduct during the revolution of 25 December, won for himself the title of baron, and later Emperor Nicholas created him count. He had the chief command in the Turkish war of 1828–9; stormed Varna; and made the famous passage of the Balkans, compelling the Porte to conclude the peace of Adrianople, for which the surname of Sabalkanski (Transbalkanian), was conferred upon him, and he was raised to the rank of field-marshal. He was appointed commander-in-chief of the army sent to put down the rebellion which had broken out in Warsaw, 29 Nov. 1830, and was also made governor of the provinces adjoining Poland. In this campaign he did not meet with success, suffering defeats at Wisniew and Stoczek, 11 Feb. 1831; at Dobre, on the 18th; at Grochow and Wawer on the 19th, and in the series of engagements fought near Praga, in March. He was, however, more successful in the bloody battles of Nur, Lornza, and Ostrolenka, fought from 15–26 May, but after establishing his camp at Kleczwo, was taken sick with cholera, and died shortly afterward.

Diedenhofen, dē-dĕn-hōf'ĕn. See THIONVILLE.

Diefenbach, Lorenz, lō'rĕnts dēf ĕn bäH, German philologist: b. Ostheim, Hesse, 29 July 1806; d. Frankfort-on-Main 28 March 1883. He was 12 years pastor and librarian at Solms-Laubach. In 1848 he settled at Frankfort-on-Main, where in 1865 he was appointed second librarian to the city. His literary industry was enormous, embracing poetry and romances, as well as those more ponderous works by which his name will live. His greatest books are: 'Celtica' (1839–40); 'Vergleichendes Wörterbuch der Gothischen Sprache' (1846–51); 'Glossarium Latino-Germanicum mediæ et infimæ ætatis,' a supplement to Ducange's well-known 'Glossary' (1857); 'Origines Europææ'; 'Hoch- und Niederdeutsches Wörterbuch' (with Wülcker, 2 vols, 1874–5).

Dieffenbach, Johann Friedrich, yō hän frēd'rĭH dēf'fĕn-bäH, German surgeon: b. Königsberg 1 Feb. 1794; d. Berlin 11 Nov. 1847. He was educated in theology, but from 1813–5 served as a volunteer in the war against Napoleon. Upon his return he devoted himself to the study of medicine, taking his degree at Würzburg in 1822. He soon became widely known as an operator; in 1830 became head surgeon in a Berlin hospital; in 1832 became a professor in the university; and in 1840 director of clinical surgery. He was distinguished as an operator, especially in the art of forming by transplantation new noses and lips. He wrote: 'Die Transfusion des Blutes und die Einspritzung der Arzneien in die Adern' (1828); 'Chirurgische Erfahrungen' (4 vols., 1829–35); 'Durchschneidung der Sehnen und Muskeln' (1841); 'Ueber das Schielen' (1842); 'Operative Chirurgie' (1844–48); etc.

Dieffenbachia, dēf-fĕn-bäk'ĭ-a, a genus of *Araceæ* (arum family), of which there are about 15 species, found in the woods of South America and the West Indies. Their leaves have sheathing petioles, and are often variegated. Their form of inflorescence is the spathe-enclosed spadix characteristic of the order, the spathe in *Dieffenbachia* being green or yellowish. The best-known species is the dumb cane of the West Indies (*D. seguina*).

Diego Garcia, dē-ā'gō gär-thē'ä, an island of the Indian Ocean, in lat. 7° S., and lon. 72° to 73° E., extends in an irregular horseshoe shape, and is 30 miles long, embracing between its extremities three minor islets (the Chagos Islands). It contains a spacious bay, and is very convenient for coaling purposes. The group has about 700 inhabitants, and is a dependency of Mauritius.

Diégo Suarez, swä-räs, a town and territory, owned by France, in the extreme north of Madagascar, on the east coast, a little south of Cape Amber. Pop. 5,000.

Dielec'tric, a name applied by Faraday to any medium through or across which electrostatic induction can take place. (See INDUCTION, ELECTROSTATIC.) Solids, liquids, and gases possess this property of transmission, though in differing degrees, and their dielectric value, or specific inductive capacity, is measured by the ratio of the capacity of a condenser in which each may form the insulator, to the capacity of the same condenser with a vacuum as insulator.

Diel'man, Frederick, American painter: b. Hanover, Germany, 25 Dec. 1847. He removed to the United States in childhood, and was graduated at Calvert College. He was a topographer and draughtsman in the United States Engineer Department 1866–72; studied art under Diaz at Munich, and established a studio in New York in 1876. He was the designer of the mosaic panels, 'Law' and 'History' in the new Congressional Library at Washington, D. C.; and was president of the National Academy of Design in 1900.

Diëlytra, dī-ĕl'ĭ-tra, a genus of plants belonging to the natural order *Fumariaceæ* or fumitories. The best-known in this country is the *D. spectabilis*, a native of northern China and the neighboring parts of Siberia, which was discovered in 1810, and is now everywhere common in Europe as a garden plant. It blossoms in April and May, and its long drooping racemes of purplish-red blossoms present a very graceful appearance. It grows freely in the open air, and only requires the protection of glass in the winter. It prefers a sunny position and a light but fertile soil, and may be propagated by division of the root. In Germany it receives the popular name of pendant heart or virgin's heart, from the shape of the blossoms.

Diepenbeeck, dē'pĕn-bäH, Abraham van, Flemish painter: b. Bois le Duc 9 May 1596; d. Antwerp 1675. He first studied glass painting, and a number of windows in different churches in Antwerp are his work. Later he studied under Rubens. Among his paintings are: 'St. Norbert'; 'Ecstasy of St. Bonaventura'; 'St. Francis Adoring the Sacrament'; 'Entombment of Christ'; 'Neptune and Amphitrite'; and the 'Flight of Clœlia.'

Dieppe, dē-ep', France, seaport, in the department of Seine Inferieure, 93 miles northwest of Paris. The harbor accommodation is extensive, there being an outer harbor and four or five inner basins or docks, and the depth of water is sufficient for vessels of considerable burden; but the entry to it is somewhat difficult. The manufactures include works in ivory, the most famed in Europe; works in horn and bone, lace-making, sugar-refining, and ship-building. Pop. 21,091.

Dies and Die Making. Dies and punches for press work may be divided into five different classes, viz: Blanking dies for cutting out blanks; bending dies for wire or sheet metal; drawing dies for drawing up tubes or shells; embossing or coining dies for coins or jewelry work; forging dies for drop forgings.

BLANKING DIES.

Blanking dies consist of a male die or punch and a lower or female die. They are made in almost every form and shape for cutting out flat blanks from steel, iron, paper, etc. Usually both punch and die are hardened and tempered; sometimes the punch is left soft, and as it gets worn is set out and refitted by being forced or shoved into the die; sometimes it is best to reverse this operation, as in punching paper, playing cards, etc., and harden the punch and leave the die soft.

Shear.—A shear is usually given to the punch or die, determined by the work it has to do; when it is intended to use the blanks, or pieces punched out, the shear should be given to the die, as less distortion is given to the metal by this method, but where the hole is the object sought, as in rivet holes in boiler plates, etc., the shear should be given to the punch.

Die-shoes.— Cutting or blanking dies are usually held in a shoe or die holder, or if a large die, it is fastened to the bed of the press direct, but as a rule the fewer pieces intervening between the press and the die the better results will be obtained. Very large blanking dies are usually made in one of two ways; either as rings set in a cast-iron holder, or by welding the rings directly on to a wrought-iron holder or die-plate; the latter method is the best in making plain dies, but cannot be used in compound dies. The welding of the steel rings together, and then on to the wrought-iron plate, calls for good work on the part of the smith. In the former method the rings are first welded and then turned, hardened and ground true in the universal grinder, then set in a groove turned in the holder and held there by being bolted from the back of the holder.

Hot Work.— In making dies for hot work (as the blanking out of nuts and other thick work from red-hot metal) a die made of chilled cast-iron with a good clearance will give good results, as the temper is not affected by the heat of the stock punched, the punch being made of steel and fitting the die loosely (in very thick stock a difference of 1/16″ or more in the diameter of the punch and die is not too much), and if a nice job is wanted, the work can be shaved, or repunched, as it is called, by forcing it through a second die that is a trifle smaller than the first, leaving a true and smooth surface.

Repunching.— In the repunching of brass and copper, the use of buttermilk as a lubricant will give a better result than any oil or soap water that we have yet found. Dies for repunching or finishing work are not in general use to the extent that they would be if the saving that could be effected by this method were well known. Many jobs now performed on the milling machine could be repunched, and better results obtained at less cost than by the former method.

Power.— The power required to blank out a piece of metal depends largely on the shape of the blank and the number of cutting inches in the die; a long narrow blank requiring more power than a round blank of the same area, the shear of the dies being equal. If the work will admit of the face of the punch being slightly rounding, less pressure will be required than with a flat-ended punch.

The first thing to be considered to determine whether a punch and die should be used to produce work is the number of pieces wanted. If it is standard work, and the demand is 100 or more per week, it is both desirable and economical to have a die made, for after the die is once made the work can be produced at a very low cost. Oftentimes when a large number of pieces are wanted, and a power feed is used, the cost will not exceed two cents per 1,000 blanks.

BENDING DIES.

Bending dies are used for forming sheet metal or wire into almost any form that may be wanted. The die shown (Fig. 1) is for bending the piece on the right-hand side of the punch. This is blanked out by a previous operation placed in the die by hand, and is bent as shown by the finished piece on the left-hand side, which does not show it so clearly as it should. The two sides of the blank are bent down and the long one on the right is curved around the punch shown and the ring on the end is twisted around to a right angle to the rest of the arm.

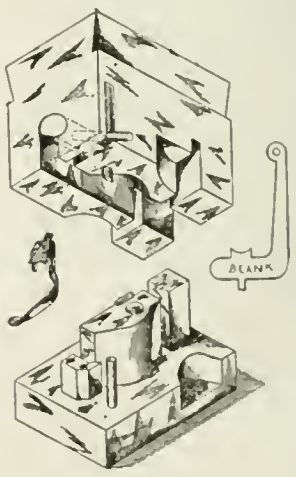


Fig. 1.

The Punch.— The punch is made from a single block of steel which is planed up to fit the press, and then machined out as shown in the cut. The twister, which is for turning the ring at right angles to the rest of the arm, is counter-bored in and held in place by the quar-

ter-inch pin driven into the side, and which is held up by the spiral spring seen at the upper right-hand corner of the sketch. The die is self-contained and is used in an ordinary single-stroke press, and requires no extra attachments to enable it to do the work. This same principle can be used in many cases, and the bending performed in one operation which would otherwise require two or more strokes of the press.

DRAWING DIES.

Drawing dies are used for shaping or drawing up sheet metal. The use of dies of this class is of comparatively recent origin; it having been first put into practical use by one De Vere of France in the latter part of the 18th century, and in the year 1827 the same process was patented for the drawing up of cartridge shells.

Origin.— In 1860 or 1861, two Frenchmen came to this country, bringing with them drawings of a model of a drawing press. These they had surreptitiously taken from a press upon which they had been employed in France. This press was secreted in a barn near the city of Wilmington, Del., and was finally perfected and put into actual use by Henry Marchand, who formed a company for the manufacture of the same, known as the Higgins & Marchand Co. The first press was set up in one corner of the shop which was boarded up, and only three men allowed in the room. The first piece drawn up was a washbasin made from a 14″ blank, which was probably the first piece of drawn work ever made in America.

Drawing dies may be divided into three kinds: the plain drawing or "push through" dies; solid bottom or "knock-out" where the work is to be knocked back; and combination dies which cut and draw at one stroke of the press. Combination dies are often so arranged as to perform three, four and sometimes more operations on the work at one stroke of the press. Dies of this nature are very expensive, and are only desirable when the work is to be done in large quantities.

Push Through Die.— Fig. 2 shows a plain "push through" drawing punch and die, the

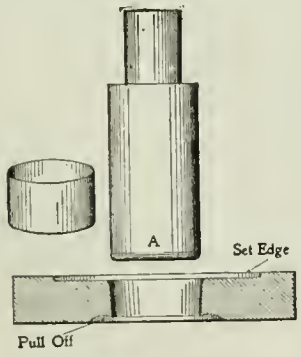


Fig. 2.

blank being punched out to fit the set edge, and then "drawn up" or rather, it is pushed through the die by the punch, and as the punch rises, the work is stripped from the punch by the "pull off" which is made very sharp for the purpose. A "draw" of about one-quarter to one-half of a degree is given the die, making it that much larger on the upper side or face, and the upper edge is rounded over and left very smooth and as hard as fire and water will make it. "Don't draw a drawing die." The lower end of the punch is rounded and left in the same shape; often the die will work better if the finish is changed from a circular to a lateral polish. The diameter of the punch is equal to that of the die, minus double the thickness of the stock to be drawn. A die of this kind can only be used on shallow work, or in redrawing or reducing the diameter of the work that has been previously drawn up; if used on deep drawing it will pucker or crimp around the edge. To avoid this there must be a blank holder to hold the stock firmly while it is being drawn.

Single Action.— Fig. 3 shows a single-action cutting and drawing die, better known as a

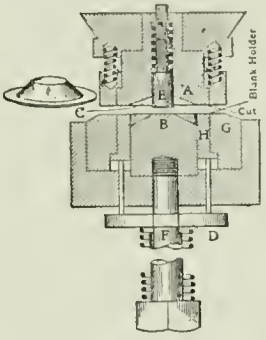


Fig. 3.

single-action combination die. A combination die is, as the name indicates, a combination of a drawing die and cutting die in one; it punches the blank, and at the same stroke of the press, draws it up into a cup or shell. The die shown is intended to be used in an ordinary single-stroke power press, and will draw up work not over one or two inches deep.

Double Action.—A double-action die is a modification of a single-action die, to be used in a double-stroke press; it can be used on work that is too deep for single-action dies The one shown in Fig. 4 is known as a "push through" die. It is somewhat like the

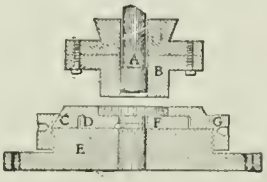


Fig. 4.

single-action die, except that the shell is cut by the punch (B) and is carried to the drawing die (D) and the lower surface of the die acting as a blank holder is held there while the drawing punch (A) forces it through the drawing die, and as the punch withdraws, the shell is removed by the lower edge of the die, which is ground very sharp for that purpose, and is known as the "pull off." The

drawing dies held in place by the cutting die being clamped upon it by the ring (G).

This style of die has this advantage; the cutting and drawing dies are independent of each other, and can be changed for a longer or shorter shell, or either die can be repaired or replaced without changing the other.

Triple Action.— Triple-action dies are intended to punch, draw and stamp the work at the same stroke of the press. The construction is the same as the double-action, except that the die block is cut away to allow the stamping die to be set in place, and the shell is carried down to the stamping die and "struck up" between that and the matrix formed on the end of the drawing punch; as the punch rises, the work is stripped from the punch by the "pull off," and is removed from the dies by the use of an inclined press, or by a swinging arm attached to, and operated by the press, that catches the work as it falls from the punch.

This style of die is largely used on blacking box covers, lard pail lids, or other work where a stamped or embossed cover is wanted. A die of this class should always be used in an arched press, as the strain of the stamping process is very severe on the "open back" style press, and is apt to crack the body of the press. In making a drawing die, use a steel that is high in carbon, and if it shrinks a little in hardening so much the better. There is on the market at least one grade of steel which will stand three successive hardenings, and will shrink each time so that the die as it wears out can be "shrunk up" and then ground out to size again.

Various modifications of a drawing die are necessary in order to successfully draw up the different metals. Zinc works better when the soap suds, or whatever lubricant may be employed, is used hot as possible, as that metal works much better at a heat of 125 degrees.

Buttermilk.— In drawing up very delicate work where the nature of the metal is such that the die is inclined to clog, or as the press hand calls it "copper up," the use of buttermilk will be found very effective.

Thick Work.— In drawing very thick work the drawing die can be made bell-mouthed, as the thickness of the metal will reduce the tendency to crimp or pucker. The same method of making the die is followed when it is desired to draw a shell that is very short in proportion to its diameter.

The possibilities of what can be done by this method of forming up sheet metal are almost unlimited, and the press of the future, as shown by the frontispiece, is not an exaggeration of what will be performed at no distant day, as trunks, wheelbarrows, sinks, and the copper boiler for hot-water service are every-day productions at the present time

Metal.— The great secret of drawing up work is to have good metal, and to properly adjust the blank holder, so as to hold the metal just hard enough to prevent it from puckering. In drawing up metal, always keep one thing in mind, that is, that metal has some of the properties of water, and it will flow where it can go the easiest. A grade of steel which will harden good, a little knowledge of toolmaking, and a good deal of experience are what is needed to make a good drawing die.

EMBOSSING OR COINING DIES.

Embossing or coining dies for coins or jewelry work are used for striking up coins, medals, emblems, or other work that has to show the imprint and the figures which are cut in the die. In the case of dies used for coin work, both the upper and lower die are embossed or engraved with the design or letter work that it is desired to have stamped on the coin; the blank being fed on to the lower die, which is surrounded by a knurled ring, and as the upper die or punch descends, the metal is confined and kept from spreading by the ring.

Dies used for coining are the oldest example of die work that we have any knowledge of, as there are in existence a number of coins which were "struck up" over two thousand years ago; showing plainly that the art of die sinking was known at that period, but the fact that they were left untrimmed or rough, on the edges, indicates that the process of punching by means of a close-fitting punch and die was not known at that time. Dies for coining could have been used in a press of very rude construction, the main requisite being that sufficient power was employed on the upper die or punch, to leave the desired impression upon the coin. This may have been done by the use of an ordinary maul or sledge, the upper die being held by hand. Coining dies are the highest example of the die-sinker's art. There are several men whose proficiency in this line is very great, and who draw salaries of from $5,000 upwards for their proficiency in this line of work.

Embossing Dies for Jewelry Work.— In jewelry dies the impression is usually cut or "hubbed" into the lower die, and the male die or "force" as it is called, being used to drive the metal into the lines drawn or cut, so as to bring up the desired design. Dies of this class are used to produce almost every known form of jewelry work. The back of a watch or locket, perhaps, being an example of this class of work we are all familiar with. Spoons, knives, and forks, and in fact almost every article of tableware are also formed up by the above method.

Hydraulic Dies.— Embossing is often done on very large pieces of work, especially on what is known as hollow-ware, such as ice-pitchers, etc., the blank being placed in the die, which is sectional and then put into the press. The blank is filled with water or sometimes a special composition of wax, which is then subjected to a very heavy pressure, forcing the pitcher or other work into the desired shape, and also into the lines which are sunk or cut in the dies.

FORGING DIES.

The use of dies for drop-forging of metal is of recent date, and was first used in gun work. The hammer of a rifle being one of the first pieces of work ever made in that manner. It consists of cutting a fac-simile of the forging desired, either in the lower die, or sometimes it is divided equally into the upper and lower die, and then the metal,

either iron, steel, or copper, is heated and "squashed" into the impression sunk in the dies. This method of producing work is rapidly increasing from the fact that the quality of the work is far better and the cost of production much lower than any other method of manufacture.

Flash.— The forging operation flings out a fin or "flash" as it is known, caused by the amount of metal being used in excess of what the dies will hold. This is either "hot" trimmed as soon as removed from the dies, or the work is allowed to cool and then "cold" trimmed; the latter work being done in an ordinary power press.

J. L. Lucas,
Consulting Expert on Dies and Press Tools; Author of 'Dies and Die-Making.'

Dies Fasti et Nefasti, dī'ēz făs'tī ĕt nē-făs'tī, a Roman division of days, with reference to judicial business, into working-days and holidays. *Dies fastus* was a day on which courts could be held and judgments pronounced; *dies nefastus*, a day on which courts could not be held nor judgments pronounced.

Dies Iræ, dī'ēz ī'rē, the first two words used as the title of a celebrated Latin hymn on the Last Judgment. This incomparable hymn consists of 17 stanzas, with an 18th of 4 lines, and is based on the prophetic passage, Zephaniah, i. 14–18. It is probably the work of the Franciscan, Thomas de Celano, who died about 1255. The sublimity and force of its thoughts are well matched by the impressive solemnity of the verse, its stanzas of three lines, each with the same double rhyme, making the inmost soul tremble, "as with three blows of a hammer," says Guericke. It is said to have first appeared in the missals made at Venice about 1250, and is one of the five 'Sequences' that have been universally used in the Roman Catholic Church since the Council of Trent. Its place is in the *Missa in commemoratione omnium fidelium defunctorum.* The Tridentine text, published in 1567, is somewhat different from that in the old missals, and another and considerably inferior version appears on a marble tablet of unknown date, in a Franciscan church at Mantua. The *Dies Iræ* has been the subject of musical compositions by Palestrina, Haydn, Cherubini, and Mozart, and no religious poem has been more frequently translated. There are English translations by Crashaw, Macaulay, Lord Lindsay, Isaac Williams, and Gen. John A. Dix. The opening stanzas are paraphrased in the 'Lay of the Last Minstrel,' canto vi. Goethe has felicitously introduced a few stanzas into his 'Faust,' and, in his novel 'Ferragus,' Balzac has given a thrilling description of its effect, when sung at a funeral or requiem mass. The following is the full text:

Dies iræ, dies illa,
Solvet sæclum in favilla,
Teste David cum Sibylla.

Quantus tremor est futurus,
Quando Judex est venturus,
Cuncta stricte discussurus!

Tuba mirum spargens sonum
Per sepulchra regionum,
Coget omnes ante thronum.

Mors stupebit, et natura,
Cum resurget creatura,
Judicanti responsura.

Liber scriptus proferetur,
In quo totum continetur,
Unde mundus judicetur.

Judex ergo cum sedebit,
Quidquid latet apparebit,
Nil inultum remanebit.

Quid sum miser tunc dicturus,
Quem patronum rogaturus,
Cum vix justus sit securus?

Rex tremendæ majestatis,
Qui salvandos salvas gratis,
Salva me, fons pietatis.

Recordare, Jesu pie,
Quod sum causa tuæ viæ,
Ne me perdas illa die.

Quærens me sedisti lassus,
Redemisti crucem passus,
Tantus labor non sit cassus.

Juste judex ultionis,
Donum fac remissionis,
Ante diem rationis.

Ingemisco tanquam reus,
Culpa rubet voltus meus
Supplicanti parce, Deus.

Qui Mariam absolvisti
Et latronem exaudisti
Mihi quoque spem dedisti.

Preces meæ non sunt dignæ
Sed tu bone, fac benigne,
Ne perenni cremer igne.

Inter oves locum præsta,
Et ab hædis me sequestra,
Statuens in parte dextra.

Confutatis maledictis,
Flammis acribus addictis,
Voca me cum benedictis.

Oro supplex, et acclinis,
Cor contritum quasi cinis,
Gere curam mei finis.

Lacrymosa dies illa
Qua resurget ex favilla,
Judicandus homo reus;
Huic ergo parce Deus.

Amen.

Dieskau, Ludwig August, lood'vĭg ow'-goost dēs'kow, German general in French service: b. 1701; d. Surenne, near Paris, 8 Sept. 1767. He was adjutant of Marshal Saxe, whom he accompanied in the campaigns against the Netherlands, and became in 1748 brigadier-general of infantry, and commander of Brest. In 1755 he sailed as field marshal to Canada, at the head of French troops, to assist in the campaign against the English. He ascended Lake Champlain with the design of attacking Fort Edward, defeated a detachment sent for its relief, and pursued them to the fort with the hope of entering it with them. He was, however, defeated.

Diest, dēst, Belgium, town in the province of Brabant, 32 miles northeast of Brussels. It was once strongly fortified. Pop. 8,531.

Diet, a meeting or assembly of delegates or dignitaries convened and held from day to day for legislative, ecclesiastical, political, or administrative purposes; specifically, the legislative assemblies of the German empire, Austria, the cantons of Switzerland, etc. The Diet of the German empire was composed of three colleges; one of electors, one of princes, and one of imperial towns, and began with the edict of Charles IV. in 1356. Each college deliberated by itself the agreement of all three together with the assent of the emperor being finally necessary for passing judgment. The best-known meetings were those at Nuremberg 1467, Worms

1521 (at which Luther was excommunicated), Spires 1529, and Augsburg 1530.

Diet. See NUTRITION.

Dietetics is the branch of hygiene that deals with the recovery or maintenance of health by right habits of eating and drinking. Diet is the daily fare regulated in accordance with a scientific study of foods and of the needs of the human body. The words diet, dietetics, and dietary, in their modern significance, appear to have a mixed origin. The dictionaries trace their derivation through the French *diète* to the Latin *dieta* and the Greek *diaita*, the latter signifying a manner of living. Another meaning, often marked archaic or obsolete by lexicographers, is "daily fare," "allowance of food," "daily pay."

> And for his diet, there was a continual diet given him of the king of Babylon, every day a portion until the day of his death, all the days of his life.—Jeremiah lii. 34.

This meaning has an evident connection with the Latin *dies*, day, and is followed in the modern use of the word dietary. As defined by Mrs. Ellen H. Richards, a dietary is "a known amount of food, of known composition, per person, per day." Popularly, dietary appears to be associated with cheap fare, perhaps because first used in connection with the allowance of food for paupers and prisoners. The word diet also conveys to the average mind the idea of a reduced food supply, probably because the individual choice is restricted.

Under primitive conditions, men satisfied hunger with any edible substances within reach. The progress of civilization, with the increase of material possessions, developed the epicure and gourmand, who magnified the pleasures of the table. The aid of the physician was then required to mitigate woes induced by over-indulgence. In the days of Hippocrates, dietetics was the province of physicians, who thus aimed to undo the evils caused by wrong living. Later, economists like Count Rumford applied dietetic principles to feeding the poor of European cities. Some countries have employed experts to prescribe rations for keeping army and navy in fine physical condition at least expense to the government. The victory in the Franco-Prussian war of 1870 has been ascribed to the food experiments of German chemists. The *erbswurst*, or pea sausage, a food having merit for emergencies, was devised by scientists at that period. Oleomargarine was the result of experiments made for the navy under direction of the French government. The aim of dietitians of the present day includes all that has gone before, the best use of materials at hand, prescription of food for the sick, and aid to the well in choosing such foods as shall maintain health, with due regard to pleasing the palate. The 20th century finds prevention wiser than cure, and endeavors by the prescription of food adapted to different ages and conditions of body to develop the sound body and sane mind. At the present time no less emphasis is laid upon diet for diseased conditions of the human body than in the past, but more attention is being given to building up healthy bodies, and then sustaining them by foods chosen with special reference to the work each individual has to do. Some study of dietetics is now included in the preparation of the citizen for life. In the public schools it is a part of the lessons in physical training, cooking or domestic science. A practical course in dietetics would cover the source and manufacture of foodstuffs, the processes of cookery and wise combinations of foods, the calculations of dietaries for individuals, families and institutions, and the adaptation of foods to individual needs according to age, sex, climate and occupation. Students of history and sociology are recognizing the effect of food in forming individual and national characteristics. The French revolution, and the destruction caused later by the Communists, has been ascribed to the ill-fed condition of the people.

Fresh air, pure water, and clean food are more essential for nutrition than any special selection of foods. The surroundings and instincts of a people lead them to adapt their diet to the climate. In the tropics fruits and vegetables are the main sources of subsistence, in arctic regions foods are chiefly animal and largely fat, supplying the heat needed by bodies subjected to severe cold. A mixed diet, both animal and vegetable, has produced the most successful races.

The usual classification of food substances is outlined by the United States Department of Agriculture in the above table.

UNITED STATES DEPARTMENT OF AGRICULTURE. *Nutritive Ingredients (or nutrients) of food.*

Food as purchased contains —

- Edible portion (e. g., flesh of meat, yolk and white of eggs, wheat, flour, etc.)
 - Water.
 - Nutrients
 - Protein.
 - Fats.
 - Carbohydrates.
 - Mineral matters.
- Refuse, (e. g., bones, entrails, shells, bran, etc.)

Uses of nutrients in the body.

Protein (e. g., white (albumen) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc.)	Forms tissue	All serve as fuel to yield energy in the forms of heat and muscular power.
Fats (e. g., fat of meat, butter, olive oil, oils of corn and wheat, etc.)	Are stored as fat.....	
Carbohydrates (e. g., sugar, starch, etc.)	Are transformed into fat...	
Mineral matters (ash)..... (e. g., phosphates of lime, potash, soda, etc.)	Share in forming bone, assist in digestion, etc.	

Sometimes it appears difficult to reconcile practical usage and scientific experiment as to food values, but this is due to an incomplete view of both sides. Many statements about foods are untrue because only one phase is presented. To decide upon the full value of any food we must consider both its physical and chemical composition, its economic value and its physiological effect in the body. The elimination of refuse, and the division and subdivision of particles in the process of manufacture are important factors in the nutritive value and digestibility of foods. Some experiments have shown that a larger percentage of peas and beans was digested when thoroughly cooked and sifted, after removing the hull, than when cooked whole. Such external digestion saves energy in the human organism. Whatever tends to cleanse and purify foods before cooking undoubtedly increases their real nutritive value. Medical authorities on dietetics have laid much stress upon the choice of foods, but hardly enough upon their preparation. A piece of meat or a vegetable, however innocent in itself, may be ruined in cooking, while one of doubtful value, by right processes of cookery, may become harmless and even useful. This is equally true from the economic standpoint. Count Rumford found that "the richness or quality of a soup depended more upon the proper choice of ingredients and a proper management of the fire in the combination of these ingredients, than upon the quantity of solid nutritious matter employed; much more upon the art and skill of the cook than upon the sums laid out in the market." The nutritive qualities of many foods are doubtless made more available by a wise use of flavors, which in themselves contain little or no nutriment. Condiments and spices, tea and coffee, and the extractives of meats are of special value for the flavor which they impart. The cheap substantial grain foods after all provide the larger part of the food of the human race, and are made palatable by changes in flavors.

The hours and arrangement for meals have an influence in the assimilation of food. Breakfast in America is a more substantial meal than it is in Europe, perhaps from climatic conditions. The midday dinner seems best adapted to children and invalids, the night dinner is a concession to the competition of business. One dietetic authority estimates that more than half of the day's ration of protein and fat and one third of the carbohydrate is taken at dinner. Therefore the hour of the meal should be such as to provide for a period of rest afterward. The savage gorges himself when food is abundant, then sleeps like an animal. The gourmand of classic days took an emetic to relieve his stomach that he might partake of delicacies yet to come. The best thought of the present day tends to shorter menus and simpler compounds, toward "plain living and high thinking."

Dietetic theories vary from age to age because of imperfect knowledge of bodily processes, or because of changes in the production and preparation of foods. Water, for example, was once excluded mainly from the dietary of patients suffering from fevers, and its use restricted in other cases. Now it is recognized that a lack of water in the diet is a serious error, and that many of our foods as served are not sufficiently diluted with water. In the past an exaggerated nutritive value was ascribed to beef tea and to gelatine, but later investigations show that the one should be classed as a stimulant, and the other not so much a real food as a protein sparer. Other points regarding which opinions have changed are these: The relative merits of different preparations of wheat, especially of the whole wheat and white flours. The former is probably better for young children, because it supplies bone-making material, but by modern methods of milling most of the nutritive material in the grain is retained in the best grades of white flour. The natural instinct of children for sweets has been repressed, but now sugar is recognized as a valuable food, provided it is taken at proper times. Oysters are less nutritious than is popularly supposed, and as ordinarily cooked are not especially easy of digestion. Combinations of foods often produce different effects from the separate ingredients, and small quantities of certain things may be helpful where larger quantities would produce bad results. A food may be nutritious, economic in the true sense, and prepared in such a way as to be easily acted upon by the digestive organs, and yet fail of perfect assimilation because it does not suit the habit or whim of the eater. In popular estimation a food is digestible when no feeling of discomfort follows after eating it, or when it is easily and quickly digested. The scientist considers a food digestible in proportion as it is completely digested whether the time be shorter or longer. Persons in health should consume some foods that digest slowly, and beware of depending upon pre-digested foods. If allowed to be idle, the stomach, like any other organ, soon finds it difficult to work.

The seven ages of man described by Shakespeare might illustrate the different periods of life calling for a change in diet.

The infant thrives and grows on a diet of milk. When the mother cannot supply a sufficient amount, clean milk from a healthy cow, by dilution with water or whey and by modification with milk and cream, may be adapted to the increasing needs of a baby as it develops. Greater cleanliness in collecting and transmitting milk to consumers is a first requisite for the diet of young children. Defective nutrition causes indigestion, rickets, intestinal catarrh and many disorders of childhood.

The schoolboy requires abundant food from which to construct his rapidly growing body and to provide energy for his active exercise. With him quantity is often more important than quality, while his sister, enjoying less active sports, is over-fastidious. Dainty children and excessively greedy ones both are usually ill fed. Nervous diseases of children, even stammering, will yield to more careful diet. Milk, fruit, cereals, whole wheat bread, eggs and vegetables should form the bulk of the diet of school children. The school luncheon now receives considerable attention from educators.

The lover and the soldier represent the college days and the strenuous life of early manhood. The training-tables for athletes in school and college are an admission of the need of a selected diet for special work. The definition of an army, given by a famous general — an animal that crawls on its stomach — indicates

the importance of proper food for the soldier. No less necessary is it for captains of industry, pioneers and explorers of all kinds. Personal idiosyncrasy and differentiation of occupation demand attention to the individual dietary.

The justice is the type of the prosperous man of sedentary habit who is often overfed, and who should begin modifying his diet after passing the half-century mark, but habits are formed and changes must be made gradually. Luigi Cornaro, an Italian who lived in the 15th and 16th centuries, began at 40 to modify his diet and succeeded in passing the century limit. After he had reached 80 years he wrote several treatises describing his manner of living. That his writings are still the basis for much that is written on diet for the later years of life, is a sad commentary on the self-indulgent habits of the human race, which shorten many valuable lives.

> I have come to the conclusion that more than half the disease which embitters the middle and latter part of life is due to avoidable errors in diet, . . . and that more mischief in the form of actual disease, of impaired vigor and of shortened life, accrues to civilized man . . . from erroneous habits of eating than from the habitual use of alcoholic drink, considerable as I know that to be.
>
> Sir Henry Thompson.

Last of all comes old age, and for this period the food should be similar to that of the young child, and taken often in small quantities. In proportion as activity diminishes, the intake of food should decrease. The sense of taste is dulled and higher seasonings may be desirable. Here if anywhere in a normal diet the stimulus of alcoholic beverages may be allowed.

During the last of the 19th century much data has been collected showing how people actually live, the cost of living and the proportions of protein, fat and carbohydrates. The studies on food and dietaries conducted by the United States Department of Agriculture have furnished much valuable data which is being used as the basis of further work on dietetics by authorities on both sides of the Atlantic. From such studies may be deduced approximate dietaries for different conditions. The ration enabling a man to do good work must necessarily be larger than one calculated merely to sustain life.

An estimated life ration for one day, measured in grams:

Protein.	Fat.	Carbohydrates.	Calories.
75.	40.	325.	2,000.

When poor families are found living on rations lower than this their diet must be enriched before they can be expected to display much energy. Prisoners often have different rations according to their time of sentence in some reformatories, and a man refusing to work is fed with stimulating food until he desires to expend some of his accumulated energy. A work ration would provide in grams:

Protein.	Fat.	Carbohydrates.	Calories.
125.	125.	450.	3,500.

For severe labor this would be increased. (The calory is approximately the amount of heat which would raise one pound of water 4° F. and is a convenient standard of measure of the fuel value of food. The fuel value of protein is 4 calories per gram, or 1,820 calories per pound; fuel value of fats, 8.9 calories per gram, or 4,040 calories per pound; fuel value of carbohydrates, 4 calories per gram, or 1,820 calories per pound.)

The estimate of the value of food in construction of new tissues is less simple than its fuel value. It is impossible to measure the amount of good that might be done in schools, hospitals, and public institutions by improving the conditions of diet. Many hospitals now employ trained directors to make dietaries and superintend their preparation. The United States Department of Agriculture issues many valuable dietary bulletins.

Diet for the sick may be considered under three general heads: the typical ration for invalids, in fluid form, suitable for the crisis of acute disease; food for the convalescent or for building up a body wasted through lack of nutrition; and last, such diet as may aid in the reduction of an overloaded body but yet sustain the vital forces. For the first few days of an acute illness the human body may sustain itself on the surplus stored in its tissues. An invalid in bed is not using up energy so fast as the man at work, hence the diet should be less generous, not a work ration but a life ration increased in such directions as may best combat the waste of disease. Liquids are easily taken, quickly absorbed, and as a whole are less irritating than solids to the digestive organs. Concentrated foods are necessary in certain conditions, but these are few. A sick person for the time being is to be fed much like an infant — small quantities of food should be given often, usually warm rather than cold. Pre-digested foods should not be used until ordinary forms fail. Where there are wasted tissues to repair — as in convalescence or in diseases like anæmia, nervous prostration, or tuberculosis, the diet must be generous — milk and eggs are the main dependence, and the art of cookery has devised many simple ways of serving them. Fat, in easily digested forms — olive oil, bacon, cream, and butter — is valuable in such cases, because fat is two and a fourth times as valuable for fuel food as the carbohydrates. For the capricious appetite attractive arrangement and service of the food, and the element of surprise are important. The cookery for the sick conforms to the usual formulas, though greater attention must be given to the selection of food and its preparation, and all doubtful articles must be avoided. Starches should be thoroughly cooked, woody fibre reduced by cooking and mashing, or removed by straining. Animal foods should be cooked at low temperature. High, composite seasonings are not desirable, but a moderate use of simple flavors is admissible. Gout, rheumatism, and obesity may not be due to over-eating in one sense, but indicate an excess of certain substances which are neither assimilated nor eliminated, but are stored up in the various tissues, causing discomfort. The many fasts of the early Church perhaps were introduced less as a religious duty than as a wise dietetic measure. The "Banting" system for the reduction of fat consists mainly in decreasing the allowance of starch and fat and increasing the protein. Special diets for other diseases should, like medicine, be prescribed by the physician in charge, because of the complications to be considered. Water-cures, milk-cures, and grape-cures have been successful in some cases. Increased knowledge of bacteria has explained many heretofore

mysterious cases of poisoning, and has changed the point of view regarding the wholesomeness of various food products. Greater attention to cleanliness in all preparation of foods would make the use of preservatives practically unnecessary. With our rapid increase in prosperity Americans in future need to guard against over-indulgence of the sense of taste and to control the appetite to accord with the true needs of the body.

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Dietrich, dēt'rĭh, **Christian Wilhelm Ernst,** German painter: b. Weimar 30 Oct. 1712; d. Dresden 24 April 1774. The picture of a peasant drinking, in the Dutch style, executed by Dietrich while a boy, is in the Royal Cabinet of Engravings at Dresden. He successfully imitated Raphael and Mieris, Correggio and Ostade. His paintings are scattered through almost all Europe. In the Dresden gallery, of which he was inspector, there are 34 of them.

Dietrich von Bern, fōn bĕrn, a hero of German legend, celebrated for his amazing adventures, and figuring in the 'Nibelungenlied.' He was in actual life Theodoric the Great, founder of the Ostrogoth monarchy; but the two names have resulted in much confusion of legend with fact. He flourished in the 5th and 6th centuries of our era. Bern is German for Verona, the principal residence of Dietrich.

Dietrichson, dē'trĭk-sŏn, **Lorents Henrik Segelcke,** Norwegian poet and historian of art and literature; b. Bergen 1 Jan. 1834. While an undergraduate in the University of Christiania, he composed many clever student songs which were collected and published in 1859. He published the poem 'Olaf Liljekrans' in 1857, and 'Kivleslätten' in 1879. His writings are numerous and among them are: 'Didactic Poetry in the North' (1860); 'The Art of Wood Sculpture in Norway' (1879).

Dieu et Mon Droit, dē-ė ĕ mŏń drwä (Fr. signifying "God and my right"), the motto of the arms of England, first assumed by Richard I., who flung this battle-cry at his French adversaries during the engagement at Gisors, 1195, to intimate that he did not hold his empire in vassalage of any mortal. It was revived by Edward III. in 1340, when he claimed the crown of France. Except during the reigns of Elizabeth and Anne, who used the motto, *Semper eadem,* and of William III., who used *Je maintiendray* as his own motto (*Dieu et mon droit* being retained on the great seal), it has ever since been the royal motto of England.

Dieulafoy, Jeanne Rachel Mayre, zhŏn rä-shĕl mār dē-ė-lä-fwä, French descriptive writer and novelist: b. Toulouse 29 June 1851. She is the wife of A. M. Dieulafoy (q.v.). Her narrative of travel in 'Persia, Chaldæa, and Susa' (1886), and her fiction 'Parysatis' (1890); and 'Rose d'Hatra' (1891), are evidences of her talent.

Dieulafroy, Auguste Marcel, French engineer: b. Toulouse 3 Aug. 1844. In 1885 he discovered in Persia the remains of the royal residences of Artaxerxes. His discoveries are described in his 'L'art antique de la Perse' (1884–9).

Diez, dēt., **Friedrich Christian,** German philologist; b. Giessen 15 March 1794; d. Bonn 29 May 1876. Having qualified himself as a lecturer at Bonn, he was appointed professor of modern languages there in 1830. In addition to various works on the poetry of the Troubadours, he published a very valuable 'Grammatik der Romanischen Sprachen' (1836–42), which was translated into English, and an 'Etymologisches Wörterbuch der Romanischen Sprachen' (1853), also translated into English. Diez laid the foundation of Romance philology, and to him all later investigators are profoundly indebted. His work stands in much the same relation to the Romance dialects as the researches of Grimm occupy with respect to the German dialects.

Difference, in heraldry, an additional figure or an alteration in a coat-of-arms to distinguish one family from another of the same strain, or particularly to mark the difference between brothers and their descendants during the lifetime of the head of the house. Sometimes this is accomplished by variations of the bordure, such as having it ingrailed, invected, embattled, ets. But usually the eldest son bears a label or lambel; the second son, a crescent; the third, a mullet; the fourth, a martlet; the fifth, an annulet; the sixth, a fleur-de-lys; the seventh, a rose; the eighth, a cros-moline; the ninth, a double quatre-foil.

Such marks of heraldic distinction cannot be regulated by cast-iron rule or set law. Each country follows the customs resulting from its own particular régime, which seem to be the adoption of changes on an escutcheon best suited to individual needs. Difference is commonly confounded with Cadency (q.v.).

Differential Equations. See EQUATIONS.

Differential Thermometer, an instrument for determining the difference of temperatures between two points or places. That of Sir John Leslie is one of the best known, and will be found described under THERMOMETER. His invention is now used only as a thermoscope. A pair of thermo-electric junctions (see THERMO-ELECTRICITY) is generally preferable to any other kind of differential thermometer. One of the junctions is put at one of the points, and the

other junction at the other point, and a galvanometer is introduced in the usual way into the circuit, great care being taken to keep all the other junctions of whatever kind that occur in the arrangement strictly at the same temperature. The strength of the current generated, which is measured by means of the galvanometer, is, with the limitation that will be found explained under the article just alluded to, proportional to the difference of temperature between the two thermo-junctions; and with the assistance of a previous experiment at known temperatures on the thermo-junctions employed, the absolute difference of temperature between the two points at which the junctions are placed may be determined with great exactness.

Differentiation, in biology, that organic process which occurs when certain parts of a uniform whole become structurally different from the others, or when, in other words, the homogeneous becomes heterogeneous. Inequality in internal and external conditions of life brings about restriction of certain vital processes and the predominance of others, and as this division of function is established, diversity of structure results. Differentiation is the structural change which is associated with the physiological "division of labor," and the process is essentially the same whether it find expression in cells, tissues, organs, or entire organisms. See Division of Labor; Evolution; Variation; etc.

Diffraction of Light, the bending of the rays of light, due to interference, as of the slits or ruled lines in a diffraction grating. The study of the diffraction of light has given us the spectrum, and the study of spectrums, through the spectroscope, has added greatly to the sum of human knowledge of the constituents of heavenly bodies. A simple way of noting the diffraction of light is to darken a room and allow a ray to penetrate between the edge of a shade and the window jamb. The light falling on the opposite wall is not a well-defined streak, like the aperture through which it passes, but is divided into a series of upright streaks or bands, showing that the rays of light bend or are diffracted in passing through the slit. Interesting experiments with diffraction can be made by allowing the light to pass through a hole or holes of different forms. The phenomena of diffraction were first noted and commented on by Grimaldi, of the Jesuits' college of Bologna, in 1665. Sir Isaac Newton investigated the subject, and explained it further. About 1819 Fresnel demonstrated that interference was result of the wave motion of light and that sound waves are similarly affected. Joseph von Fraunhofer, of Munich, made a most exhaustive study of diffraction, and classified the lines of the spectrum, which became known as "Fraunhofer's lines." He invented the diffraction grating about 1821, for exhibiting the lines and forming the spectrum. This grating, as at first made, was a glass surface, smoothed as perfectly as possible, and covered with a thin film of gold-leaf, lampblack, gelatine, or the like. Through this film were scratched or ruled parallel lines, constituting minute apertures for light. In order that these lines might be made very fine, close, and accurate, the dividing engine (q.v.) was devised. With this were ruled a great many thousand lines to the inch. These lines must be exactly the same distance apart to be valuable. When the light was allowed to pass through the rulings or slits of this transmission grating to a screen, the light on the screen was divided or dispersed, appearing in bands, and forming a spectrum. It was found that to obtain a satisfactory spectrum, a grating of 15,000 to 20,000 lines to the inch was desirable, and even very much finer rulings have been demanded and manufactured. In order to use gratings ruled on plane surfaces for spectroscopic purposes, it is necessary to employ a telescope and collimator. After a time the reflecting grating was invented. In this a surface of speculum metal was ruled, and this had some advantages over glass. Prof. Henry A. Rowland, of Baltimore, has achieved distinction in the production of improved diffraction gratings, making a reflecting grating with a concave surface, that can be used without lenses. The diffraction grating has been much used in studying the solar spectrum. See Light; Spectrum; Spectroscope.

For further information as to diffraction gratings, see 'Gratings in Theory and Practice,' in 'Astronomy and Astro-Physics,' Vol. XII., 1893. For information as to diffraction, consult Preston, 'Theory of Light' (London 1895).

Diffusion, in physics, is the graduat and spontaneous molecular mixing of two fluids in contact. It takes place regardless of or in opposition to gravitation, and is due to the mutual attraction of molecules. Diffusion is most common between gases, and the lighter the gas the faster does diffusion take place. It also occurs between viscous substances and, in some cases, between solids. A common experiment for exhibiting the diffusion of gases is to place in contact vessels of hydrogen and oxygen. After a time it is found that the contents of both vessels are alike — a homogeneous mixture of the two gases. If the heavier gas is placed below the lighter, the result is the same, demonstrating the fact that gravity does not check the result. If chlorine is one of the gases used, its color will enable the eye to follow the diffusion. If a porous body is placed between the vessels, the rate of diffusion can be measured. This fact is taken advantage of in the construction of the diffusiometer, invented by Thomas Graham. This consists essentially of a tube containing a gas, the lower and open end of the tube being dipped in mercury, while the upper end is closed with a porous plug. The rise of the mercury in the tube serves to measure the diffusion of the gas through the plug. Another method of testing diffusion is to fill a diffusion-tube with hydrogen and immerse the lower and open end in water, while the upper end is closed with the porous plug. Diffusion then takes place both ways, into the water and into the air.

Alcohol and water afford one of the readiest means of testing the diffusion of liquids. They will diffuse the same as gases, regardless of gravity. Stirring the two hastens the diffusion, because it brings a larger surface of one liquid against the other. At the same time the action is not a mixing in the ordinary sense, but a mixing of the molecules, forming a liquid that is of like proportions throughout when the diffusion is complete. If water in a glass vessel be colored with a few drops of litmus solution, and sulphuric acid be introduced through a tube to the bottom of the vessel, care being taken not

to disturb the water, the diffusion may be observed visually. The water, which is blued by the litmus, turns from blue to red as the diffusion of the sulphuric acid progresses. Some manufacturers of sugar have used the principle of diffusion for extracting cane-juice, and also for making an extract from beet-root. Hot water is applied to the cut cane, and diffusion withdraws a large part of the juice, securing the sugar. Surgeons have also utilized diffusion to cause a liquid to pass through a membrane or tissue of the body. It is the principle of diffusion of liquids that enables the druggist to compound the several items of a prescription. The uniform strength of his solutions and extracts is also largely dependent upon diffusion. If it were not for this, several fluids in a vessel would tend to arrange themselves in layers according to gravity, as is the case with water and oil, which do not diffuse together. Substances in solution also diffuse, following Fourier's law of the diffusion of heat. As the temperature rises the rate of diffusion increases. Since the rate of diffusion of different solutions and liquids varies, it becomes possible to separate component substances in solution, by taking advantage of the difference in rate of diffusion of each component. It has been demonstrated that some solids diffuse, though with extreme slowness. Lead placed upon gold for a period of years will be found to contain gold to a slight distance above the point of contact.

For a fuller understanding of the diffusion of gases, see KINETIC THEORY. Compare also OSMOSIS, which is, practically, diffusion taking place through a membrane.

Digam'ma, in the Greek language. In addition to the smooth and rough breathings, the ancient Greek language had another, which remained longest among the Æolians. This is most commonly called, from the appearance of the character used to denote it, which resembled our letter F, a *digamma*, that is, double Γ. It was a true consonant, and appears to have had the force of *f* or *v* or our *w*. It was attached to several words, which, in the more familiar dialect, had the smooth or rough breathing. Though the whole doctrine of the digamma is obscure, yet it is found in early Greek words, especially in Homer.

Digby, SIR Everard, English conspirator: b. 16 May 1578; d. 30 Jan. 1606. He enjoyed some consideration at the court of Elizabeth and James I., by whom he was knighted. Being gained over by Thomas Tresham to the extreme Catholic party, he was induced to give £1500 toward the expenses for the execution of the gunpowder plot. On the discovery of the conspiracy he was tried and hanged in 1606.

Digby, SIR Kenelm, English physical philosopher: b. Gothurst, Buckinghamshire, 11 July 1603; d. London 11 June 1665. His great-grandfather bore arms for Henry VII. on Bosworth field; his father, Sir Everard (q.v.) died on the scaffold as one of the leading Catholic gentry implicated in the gunpowder plot, 1606. Kenelm, then 3 years old, was educated as a Protestant, but at the age of 33 returned to the faith of his fathers. After completing his academic studies at Oxford he went on his travels through France, Spain, and Italy; in 1628 equipped at his own cost a squadron against the Algerine corsairs, and incidentally defeated a Venetian force off Scanderoon. Returning home, 1638, he was thrown into prison as a royalist and not liberated till 1643, when he retired to France; there he was in high favor with the court and with men of learning and philosophers, among them Descartes. At the overthrow of the royalist cause he returned to England but was banished under pain of death by the Parliament. He then for a time served the French king in various embassies, but under the protectorate came back to England and was admitted to the intimate friendship of Cromwell. He was one of the founders of the London Royal Society. His works on physical philosophy, on natural science and on metaphysical subjects possess now only the interest of curiosity; among them are a 'Treatise on the Nature of Bodies,' 'Peripatetic Institutions,' 'Treatise on the Soul,' etc. On religious matters he wrote many books, among them 'A Conference About a Choice of Religion,' and 'Letters' on the same subject. His brief critique of Sir Thomas Browne's 'Religio Medici' gives a specimen of his style of argumentation. He was all his life an inquirer into occultism and wrote a book on 'The Cure of Wounds by the Power of Sympathy;' he hoped also to discover a means of conserving into old age the extraordinary personal beauty of his wife, and invented cosmetics to that end.

Digby, Kenelm Henry, English antiquarian; b. 1800; d. London 22 March 1880. He was graduated from Trinity College, Cambridge, in 1819, and in 1822 published 'The Broad Stone of Honor,' "that noble manual for gentlemen," as Julius Hare called it, "that volume which, had I a son, I would place in his hands, charging him to love it next to his Bible." It was much altered in the 1828 and subsequent editions (the latest 1877), its author having meanwhile become a Roman Catholic. Among his other works may be named 'Mores Catholici, or Ages of Faith' (1831–40).

Digby, William, English journalist and East India merchant: b. Wisbech, Cambridgeshire, 1 May 1849; d. 24 Sept. 1904. He was engaged in newspaper work in England 1868–71; in Ceylon 1871–6; in Madras 1877–9; and again in England 1880–2. After 1888 he was an East India merchant in London. He has published: 'Forty Years' Citizen Life in Ceylon'; 'The Famine Campaign in Southern India' (1876–8); 'History of the Newspaper Press of India, Ceylon, and the Far East'; 'Indian Problems for English Consideration'; 'Nepal and India'; 'Condemned Unheard'; 'Indian Economics'; 'Prosperous British India' (1901); 'Natural Law in Terrestrial Phenomena'; etc.

Digby, Nova Scotia, on Saint Mary's Bay A United States consular agent is stationed here. The town is noted for its curing of a variety of small herrings or pilchards. Pop. 1,150.

Di'gest. See CIVIL LAW.

Digest'ants, remedies that aid digestion, and which may include such agencies as exercise, sunlight, and pleasurable emotions, although the term is usually restricted to the drug agents that modify the secretions found in the stomach and intestines. The most important of these drug agencies that are employed for the

purpose of stimulating the appetite are the bitters, such as cinchona, columba, quassia, nux vomica; the carminatives, such as cinnamon, cloves, ginger, cardamom, capsicum, peppermint; alcoholic mixtures, such as the wines, brandy, whiskey, the cordials; the digestive ferments, such as diastase, pepsin, pancreatin; and the weak alkalies and weak hydrochloric acid.

Digester, a closed boiler in which a temperature above the boiling point can be obtained, the hot water and steam disintegrating or digesting the substance treated. The invention of the digester is credited to Denis Papin, a French scientist. He noted that anything boiled in an open vessel was not subjected to a heat above 212° F., as the water went off into steam at that temperature, and was lost. Accordingly he constructed a boiler with a closed top, to retain the steam, and succeeded in securing a temperature of 400° F., which served to readily digest bones. This digester came into use for the manufacture of soups and gelatines from bones that had been previously wasted or thrown to the dogs.

Within recent years the digester has found a place in a number of industries. The lard or grease tank of a slaughter-house is a digester. In some American cities digesters have been employed to receive garbage and secure a product of some value from the refuse. Tannin is extracted from nutgalls by a digester, in which the material is saturated with ether.

The digester has found its most extensive use, however, in paper-making. The wood, which is abraded by grinders from the log is introduced in a form resembling fine sawdust to the digester, and comes out pulped, ready to be rolled into paper. Sulphite digester is the common name for these mechanisms owing to the fact that a bisulphite solution is employed in the process of digesting. This serves as a solvent, but being acid it attacks the iron or steel of which the digester is constructed. To protect the iron shell various linings are employed. The "Non Antem" digester employs a lining made of a continuous sheet of lead placed against the inner sides of the shell, and held in place by two courses of acid-proof brick. The Mitscherlich digester is lined with acid-proof brick laid in Portland cement. The Graham digester is made of sheets of boiler plate, with the lead lining soldered on before bending. The Partington digester is made spherical, so that the lead lining tends to maintain its place from its form; the lead is also burned to the iron. Pusey & Jones build a digester of welded steel, with double shells and no lining. The Schenck digester is also unlined, being made of deoxidized bronze, and in both of these last-named the erosion is claimed to be very slight.

Most sulphite digesters are built in the form of an upright cylinder, with one or more manholes at the top, through which the ground wood is introduced. Steam is admitted by coils, and a high temperature maintained for about eight hours. When properly cooked, the liquid is run off and the digested material withdrawn by manholes in the bottom.

Digestion, the change which food undergoes in order to prepare it for the nutrition of the animal frame. It is carried on in the higher animals in the digestive system. In some of the lowest forms of animal life (amœbæ) which have no special organs, particles of food are drawn into the body and digested. In higher organisms there is a simple pouch which leads inward from the centre of the cluster of tentacles; into this fish and other food are drawn and digested, while the undigested parts are afterward voided through the same aperture by which they entered. In still higher organisms, man himself included, this simple pouch is changed into a complex and greatly elongated tube, which is provided with one aperture (the mouth) by which food enters, and another aperture (the anus) through which undigested matter leaves the body. The mouth in most animals is provided with hard tissues — teeth, beaks — for the subdivision of food before it is swallowed. Vegetable feeders, eating tough grains, roots, and fibres, have large molar or grinding teeth, while the carnivora have these same teeth modified so as to present a cutting edge, with which and their pointed canines meat is torn and cut into pieces, which are then swallowed. Below, the cavity of the mouth passes into the gullet or œsophagus, and in front of this tube runs the windpipe. Food will pass through the pharynx, or the interior of the throat, into the gullet; and air, during respiration, passes through the pharynx on into the larynx and windpipe; a valve called the epiglottis partly closes the aperture of the larynx.

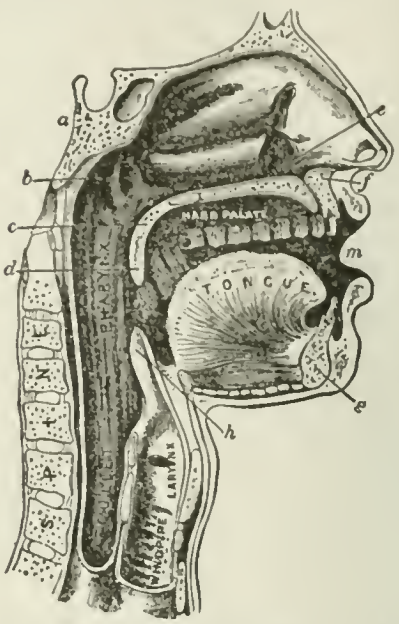


FIG. 1.— Section Through Mouth, Nose, etc.— a, sphenoid bone; b, Eustachian tube; c, soft palate; d, uvula; e, nasal passage; f, upper jaw; g, lower jaw; h, epiglottis; m, mouth.

The gullet or œsophagus is a long tube passing from the pharynx to the stomach. Its mucous coat is loaded with very large glands which secrete a quantity of very viscid mucus. The stomach itself is a greatly dilated part of the digestive system. It may be said to consist of two parts, even in the human subject; a more complex arrangement is found in many animals, such as the ruminants. The large dilated portion into which the gullet opens is termed cardiac, and the opening the cardiac or

œsophageal opening. The mucous membrane, which, whole is lined with in the empty stomach, is thrown into projecting folds or rugæ, but these folds are effaced when the organ is distended with food. In the membrane are innumerable glands which secrete the digestive juices of the stomach. The gastric juice is acid, and the chief acid secreted is hydrochloric acid. The substance called pepsin, which is necessary for digestion, is secreted by the whole of the glands.

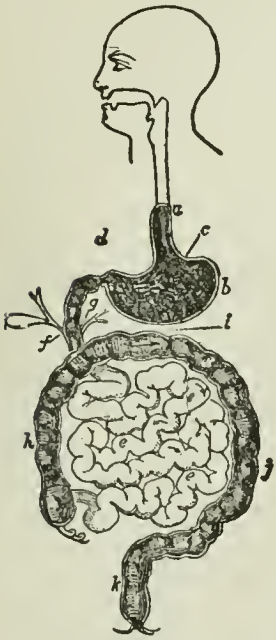


Fig. 2.—Alimentary Canal.—a, œsophagus; b, stomach; c, cardiac orifice; d, pylorus; e, small intestine; f, biliary duct; g, pancreatic duct; h, ascending colon; i, transverse colon; j, descending colon; k, rectum.

The food now called the chyme passes into the small intestine, a tube about 20 feet long. This tube, besides the muscular and mucous coats, possesses an external coat of loose fibrous tissue covered by a single layer of flat cells. This coat is prolonged into and helps to form the mesentery, a membrane connecting the intestine with the abdominal walls. This membrane is called the peritoneum. The small intestine is somewhat arbitrarily divided into three portions —the upper (duodenum), the middle (jejunum), and the lower (ileum). The mucous coat contains glands very like the pyloric glands of the stomach, called Lieberkühn's follicles. They secrete the intestinal juice. In the duodenum one finds in addition highly branched glands called Brunner's. In both the mucous and sub-mucous coats, and generally involving both layers, are found masses of tissue — lymphoid — similar to that found in a lymphatic gland. Their function is probably connected with the blood and the blood corpuscles. Collections of these solitary glands, forming oblong patches about two inches long, are called Peyer's patches. In addition to the follicles of Lieberkühn and the glands of Brunner, there are the liver and the pancreas, which pour their digestive juices into the small intestine. The bile, which is the secretion of the liver, is formed continually by that organ, but the amount thus formed is influenced by the kind and quantity of food taken. The bile is to be looked upon not only as a digestive juice, but as a drain or channel of excretion, whereby effete and useless matter is removed from the body. The pancreas is very similar in structure to a salivary gland. It secretes the pancreatic juice which pours with the bile into the digestive system. The mucous membrane of the small intestine contains, in addition, little projections called villi. These are important absorbents. This property they share with the whole of the digestive system through any part of which, and especially through the walls of the stomach and small intestine, digested matter passes into the numerous blood capillaries which form everywhere a dense network. The villi are peculiar, for each one contains in addition to blood vessels a small lymph vessel or lacteal. Nearly all the fat absorbed by the digestive system is taken up by the little cells of the villi, and passes on into the lacteals and thence to the blood.

The unabsorbed food, mixed with the various secretions we have mentioned, now passes into the large intestine, where both digestion and absorption go on, though to a less extent. The large intestine is only five feet in length, but its girth is much greater than that of the small intestine. It commences with the cæcum, a dilated part, into which passes a little blind canal (the vermiform appendix) a large and important structure in some animals. The large intestine ascends on the right side (ascending colon), crosses over to the left side (transverse colon) and descends again (descending colon), and makes a bend (sigmoid flexure), and finally terminates in a somewhat enlarged portion (rectum). The mucous membrane of the large intestine differs from that of the small intestine in containing no villi or Brunner's glands. Lieberkühn's and solitary glands are present, but the aggregation of the latter into Peyer's patches is nowhere to be found.

When food is taken into the mouth it is at once swallowed, unless it is in a solid form. In this case it is chewed into a convenient size for swallowing, for which purpose it is, in addition, mixed with the viscid saliva and juices of the mouth. Many animals can hardly be said to masticate; such are the carnivora (dog, cat, etc.), and they are not provided with grinding teeth. In most animals living on vegetable food large flat grinding molars are found. In these animals, not only is the food finely divided in the mouth, but the food, largely consisting of starch, is partially digested by the saliva. During mastication the food would nat-

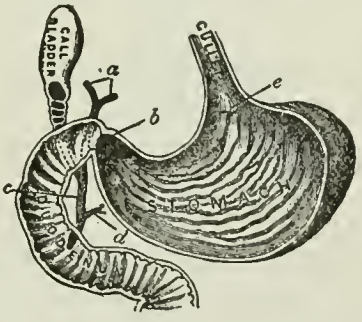


Fig. 3.— Section of the Stomach.— a, ducts of liver; b, pylorus; c, bile duct; d, pancreatic duct; e, cardiac orifice.

urally tend to escape from between the grinding surfaces of the teeth, and would collect within the mouth and outside the gums. This is prevented by the muscles placed in the substance of the cheeks and lips.

As a result of mastication, the food is gathered in the form of a round moist bolus on the upper surface of the tongue. It is now ready to be swallowed. In the first place, it is

pushed backward by the tongue and seized by the teeth, many of which are attached to the hyoid bone. According to the most recent investigation, the bolus is propelled with great rapidity through the pharynx and gullet into the stomach. Following the propulsion of the food downward there is a wave of contraction, which, commencing in the pharynx travels comparatively slowly downward through the gullet. It is seen then that swallowing is not due to the falling of liquids down the throat. A horse drinks "up-hill," and the jugglers, or indeed anyone can drink or swallow with the head vertically downward. When the food has reached the back of the mouth, swallowing occurs irrespective of the action of the will.

There is a possibility that during swallowing the food may go the wrong way — that is, it may pass into the larynx and windpipe. It is prevented from passing into it by the elevation of the larynx which pushes its aperture against

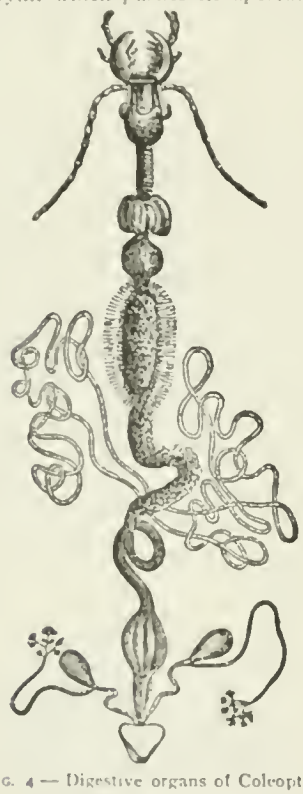


Fig. 4 — Digestive organs of Coleoptera.

and under the back of the tongue, which at the same time is pushed backward. In addition, there is a valve called the epiglottis, which is pushed down over the larynx by the movement just described and by muscular fibres which act upon it for that especial purpose. The walls of the stomach and intestines are, like the gullet, provided with muscular fibre. An external layer passes in the length of the gut, and within this is a circular layer. These muscles contract slowly on stimulation, and are outside the domain of voluntary action. During the digestion they contract peristaltically, urging the food toward the rectum. The peristaltic waves may begin in any part of the gut and pass slowly downward followed at varying intervals by other waves. Probably what is called antiperistaltic waves may occasionally occur, tending to bring the food back toward the mouth, for bilious matter is frequently vomited, the bile having in all probability passed upward into the stomach by antiperistalsis from the duodenum.

Eructations are frequently caused by antiperistalsis and by a movement of this kind food is brought back into the mouth for further chewing in the ruminants (sheep, oxen, etc.). The act of vomiting is a reflex nervous act. It can be excited by stimulating the branches of the vagus nerve, as when indigestible and irritative food is taken, or emetics are administered. By tickling the back of the throat with a feather, the glossopharyngeal nerve is stimulated and vomiting may readily be produced. It is of frequent occurrence in painful irritations of the uterine nerves in pregnancy, of the nerves of the liver and kidneys during the passage of a hepatic or renal stone, or indeed when irritation of any sensory nerves takes place. Cases in which irritating or poisonous substances are swallowed are so frequent that everyone should be aware that a large quantity of hot liquid, especially if it contains much salt or some mustard, forms a safe and speedy emetic. Ice is a valuable sedative, and often prevents vomiting.

In many animals, such as the sheep, ox, and camel, the stomach consists of several cavities communicating with one another. In the ox and sheep the cardiac and the pyloric portions are each subdivided into two compartments. The cardiac part consists of a very dilated cavity, the paunch (rumen), into which the food is passed as soon as swallowed. In addition there is a smaller part, the reticulum (honeycomb) so called from the folds of lining mucous membrane which intersects, forming a reticulum. The pyloric half is divided into two parts. The psalterium (maniplies), so called from the lamellated appearance of its mucous membrane, communicates with the last division, the rennet stomach (abomasum). Fluid passes either into the first, second, or third part of the stomach, and thence on into the fourth. Solid matter, such as grass, roots, etc., passes either into the paunch or reticulum. This is mixed with the saliva swallowed with it and in addition it is mixed with juices formed by the mucous membrane of these cavities. When the animal has finished feeding, it lies down and rumination commences. Due in part to the contraction of the abdominal muscles and diaphragm, the food is propelled in the form of rounded pellets from the paunch and reticulum up into the mouth. The pellets are there thoroughly masticated, and are returned in a pulpy condition to the stomach. Now the food passes into the psalterium, and into the rennet stomach. Hence the consistency of the food determines into which part of the stomach it passes.

In the bird some interesting modifications in the structure of the alimentary canal are seen. The gullet at about the middle of its course is provided with a pouch or crop. Into this the food passes, and is bathed by a secretion formed by its glands. It is then propelled onward into a dilated cavity, the proventriculus, and is acted on by digestive juices. Thence it passes into the gizzard. This cavity is provided with muscular walls of enormous thickness in the case of birds that are vegetable feeders. It is lined by thick and corneous epithelium, and in

its interior are generally found pieces of stone, chalk, etc. The gizzard is a powerful mill, which grinds the food into a soft pulp, upon which digestive juices can readily act. See BIRDS.

The most essential change which food undergoes in digestion is one of solution. Albumen, starch, fat, and other food-stuffs are insoluble in the circulating fluids of the body, and injected into the blood they would block up the smaller blood vessels. During digestion these pass either into nearly allied chemical substances which are readily dissolved in water, or in the case of fat partly into a soluble soap and partly into a state of microscopically minute subdivision. It is not sufficient, however, to have a soluble food-stuff in order that it may be absorbed and used by the body. Cane (table) sugar is soluble in water, but it is of no use as cane-sugar to the body. If injected into the blood vessels it is at once secreted by the kidneys. During digestion it is converted into another sugarless soluble, but in a form which can be used by the economy.

The digestion of food is brought about by the action of the saliva, the gastric, pancreatic, intestinal and other juices. These are mixed with the finely divided food by the movements of the alimentary canal. The digestive juices are in all cases secreted by the microscopic cells which line the various glands opening into the digestive system. The digestive ferments are not whole cells, they are the products of cells. They are not the broken-down, useless substances, such as carbonic acid, water, etc., which all cells give out, and which an animal like man excretes. They consist of a very complex active matter, of which we know almost nothing, and which we class with other substances of which we know little more, under the head albuminoids.

When food is passed into the stomach, secretion occurs. This, too, may result from mechanical irritation, as when through an opening (fistula) the mucous membrane is brushed with a feather. In all cases the stomach, pale before, becomes suffused with blood, and the gastric juice is poured out. The flow of the intestinal juice, the pancreatic juice, and bile all follow the stimulation of the mucous membrane, and in all cases the blood vessels enlarge so as to give the cells a good supply of food, though, as we have seen, they themselves actually pass into a condition of activity as a result of the influence of special secreting nerves. Foods belong to four classes: (1) Proteids — albumens, globulins, etc.; for example, the white of egg, the chief constituent of meat, the gluten of bread. (2) Carbohydrates — starches, sugars, gums; for example, potato-starch, cane- or grape-sugar. (3) Fats and oils; for example, suet, marrow, olive oil. (4) Minerals; for example, water, table salt, iron, phosphates.

Some few substances are absorbed without being digested at all; they do not need to be. Such are water and the minerals, though even many of these undergo some change. Grape-sugar is absorbed and probably proteids too are often absorbed to some extent at least. Fat is profoundly modified during digestion, though not as the result of any digesting ferment. The saliva, of which about 30 ounces are secreted during the 24 hours, contains a ferment termed ptyalin, which is capable of turning a starch into a soluble sugar called grape-sugar, or, according to other observers, into another soluble sugar termed maltose. The ptyalin may be extracted from the saliva or from the salivary glands themselves. It does not appear to be much exhausted during its activity and has the general characters of unorganized ferments. The saliva is alkaline, and the starchy food is no doubt partly converted into sugar during its sojourn in the mouth and gullet by its action. When the food has reached the stomach and the acid gastric juice has mixed with it, the saliva is unable to act and is probably killed. Any digested starch is subsequently converted into sugar when the food reaches the small intestine by the pancreatic juice.

When the food reaches the stomach it causes a reflex secretion of gastric juice. This is but slowly produced when insipid heavy food, such as coagulated white of egg, boiled meat, sago, etc., is eaten, but flows readily when soups, broths, and fluids containing salts and extractions in abundance are taken. Thus we have a scientific reason for beginning a dinner with soup, preserving the *pièce de résistance* until the stomach has secreted gastric juice for its digestion. The gastric juice, several pounds of which are secreted daily, is acid in reaction containing free hydrochloric acid. Lactic and butyric acids form during the progress of digestion.

Within the stomach, and capable of being readily extracted from the stomach of a calf, is a ferment called the milk-coagulating ferment (rennet). This causes milk to coagulate and form a clot or curd. It subsequently contracts and squeezes out some fluid termed the whey. It is difficult to assign any use to this ferment, for the acid of the gastric juice would of itself cause the milk to curdle. Still more difficult is it to explain the existence of a similar ferment in the pancreatic juice, for we cannot suppose that any milk can even pass through the stomach to be subjected to its action. The milk, indeed, often forms dense clots which cannot afterward be digested, and which cause considerable gastric irritation. Milk is frequently found to disagree with some stomachs; but even in such cases it may often be sipped with impunity. In this case the formation of large clots is prevented. Lime water causes the milk to coagulate in small soft clots.

Within the small intestine most of the food undigested by the stomach (q.v.) is rendered fit for absorption. This takes place through the tissue of the mucous membrane; much of the sugar and peptones find their way into capillary blood vessels. Absorbed products and notably fat globules pass into the lacteals, and thence into the blood, circulating through the veins at the root of the neck. The contents of the lacteals during absorption are called chyle. The contents of the small intestine pass into the large intestine, where digestion occurs to a very slight extent. Absorption is, however, more rapid, and the contents become far more solid as they pass toward the rectum, due to the deprivation of water and soluble substances. The absorptive power of the large intestine is important to remember; for injections per rectum of liquid food, especially if it has already been artificially digested, may sustain life for long periods.

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Diggings, a colloquial expression among miners in North America, Australia, South Africa, etc., the term designating the places from which gold is procured by means of surface excavations. Proceeding from the mining regions this appellation has become an everyday expression in referring to a region, locality, or place, as:

'She won't be taken with a cold chill when she realizes what is being done in these diggings?' Dickens, 'Martin Chuzzlewit.'

Diggs, Annie L., American author and librarian: b. London, Ontario, Canada, 1853. She was the first woman to lead a delegation at a national political convention, serving as chairman of the delegation from the District of Columbia, at the National People's Party Convention, Omaha, 1892. She is a temperance worker and political speaker, and president of the Kansas State Woman Suffrage Association, and she has been State librarian of Kansas since 1898. She is the author of 'Little Brown Brothers,' and many short stories.

Dighton Rock, a boulder of "greenstone" (in fact, bluish-gray), in Berkley, Bristol County, Mass., opposite Dighton, the landing-place for it; on the east shore of the Taunton River, about 10 feet from low-water mark, and covered two or three feet deep at each flood tide. It is 11½ feet long and about 5 feet high, with a flat face toward the river, once covered with inscribed characters varying from scratches to one third of an inch deep, not chiseled, but "pecked" in. For many years the stream of visitors, unchecked by any authority, have so often scrubbed off the tidal deposits of dirt with brooms and water to see the characters more plainly, that most of the latter are effaced and the whole past effective study. From old drawings, however, and comparison with similar petroglyphs elsewhere, there is no doubt it is Indian; Schoolcraft says, in the symbolic character of the Kekeewin. (See Garrick Mallery in annual report of the Bureau of Ethnology, 1888–9, pp. 85–6, 762–4; from Dr. Hoffman's examination of 1886.) Enthusiasts at various times have made wonderful interpretations of it. Rafn of Copenhagen found the name of Thorfinn on the drawing sent him (see his correspondence with the Rhode Island Historical Society 1830–4, in 'Antiquitates Americanæ,' Copenhagen, 1837), and thought it a record of the Vinland settlement; an Orientalist deciphered "melek" (king), and considered it Phenician, and another believed it Scythian. Many drawings have been made of it since the first by Samuel Danforth in 1680, and a second by Cotton Mather in 1712; for which, and a picture of the rock *in situ*, see Rafn as above, and for the drawings, the report above cited.

Digit, in arithmetic, usally signifies any one of the 10 numerals, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, though zero is sometimes not regarded as a digit. The word comes from *digitus*, a finger; thus indicating the humble means originally employed in computations. Digit is also a measure of a finger's breadth equal to three fourths of an inch.

Digit, in astronomy, is the measure by which we estimate the quantity of an eclipse. The diameter of the sun or moon's disk is conceived to be divided into 12 equal parts, called digits; and according to the number of those parts or digits which are obscured, so many digits are said to be eclipsed. When the luminary is wholly covered, the digits eclipsed are precisely 12; and when it is more than covered, as is frequently the case in lunar eclipses, then more than 12 digits are said to be eclipsed.

Digitalin, dĭj'ĭ-tā-lĭn, various substances obtained from the leaves and seeds of the common foxglove (*Digitalis purpurea*), some of them being deadly poisons, but of great medicinal value, while others are almost inactive or harmless. Of these the earliest extracted was Homolle's digitalin, prepared from the leaves by the action of alcohol, ether, and lead oxide. It is a white, bitter, partially crystalline body without smell, soluble in alcohol, but not in water or ether, and has been used in medicine. Another digitalin was obtained by Walz by treating that of Homolle with ether and water; it is yellow, amorphous, soluble in water, and very powerful in its action. Another chemist, Nativelle, obtained from the leaves two crystalline bodies, known as digitalin and digitin, and an amorphous one called digitalein. Digitalin, prepared by various processes, and probably not chemically pure, is employed in medicine, being useful in stimulating the action of a weak heart, and effective also in removing dropsical fluid by its action on the kidneys; but it is apt to derange the stomach and bowels, cause loss of appetite, etc.

Digitalis, dĭj-ĭ-tā'lĭs, a name given to the leaves of the plant *Digitalis purpurea* (see FOXGLOVE), of the second year's growth. This is a biennial herb which is largely cultivated for ornament. It is about two to five feet high, with large succulent leaves and tubular urn-shaped purple flowers growing in a raceme. It is a native of southern and central Europe, and is extensively cultivated throughout the world, although the cultivated leaves are not as serviceable as those of the wild plant. The leaves, which lose on drying about 75 per cent in weight, are mostly obtained from the wild plants growing in the mountainous regions when two thirds of the flowers are expanded. The leaves should not be kept more than one year, as the quality deteriorates very rapidly. The active principles in the digitalis leaves consist of four or five glycocides: digitoxin, digitophyllin, digitalin, digitalein, and digitonin. The seeds also contain large amounts of active glycocides. The action of digitalis on the body is complex. It is primarily a local irritant causing secondary paralysis of the sensory nerve-endings. It is bitter to the taste, followed by burning and swelling of the mucous membrane. It is an irritant to the intestines, where it may cause nausea and vomiting. After absorption the chief action of the drug is on the central nervous system, the heart, and the blood vessels. The action on the nervous system is of secondary value to the heart activities, although there is distinct stimulation throughout. The action of the drug on the heart-muscle is the most important property possessed by digitalis, both pharmacologically and therapeutically. Here, by reason of the complicated physiology of the heart action, the differing effects of digitalis on this organ are somewhat difficult to comprehend. Digitalis stimulates primarily the muscular fibres of the heart. It stimulates the cardiac nervous gang-

lia; and it stimulates, and then paralyzes, the cardiac inhibitory nerve, the pneumogastric. Thus the normal heart, under the action of small doses of digitalis, is at first made to beat somewhat more strongly and rapidly; but as soon as its action upon the pneumogastric becomes manifest, in larger and increasing doses, the heart action becomes more powerful and is somewhat slowed; and in full medicinal doses, frequently used in medicine when the effects of digitalis are desired, the action of the heart is much stronger and considerably slowed. The blood-pressure is high, and the arteries are contracted. If, however, the use of digitalis is pushed beyond this point, its action as a paralyzant of the pneumogastric begins to be evident. By reason of this loss of the inhibitory action of the pneumogastric, the heart action at first is stronger, and the beat becomes more rapid. If still further toxic doses are given, the heart runs away, as it were. It beats very rapidly, irregularly, and with increasingly weakened force, until it finally stops exhausted. Digitalis also increases the secretion of urine; it raises the pressure of the blood vessels, and increases the amount of blood in all the organs of the body, including the heart itself. It is thus one of the great cardiac tonics, when used within physiological limits, and is indicated in most cases of heart disease where there is malnutrition caused by the dilatation of the chamber or a leakage of the valves.

Digita'ria, a genus of grasses, commonly called finger-grasses, now classed under the genus *Panicum*. See FINGER-GRASS.

Digitigra'da, a group of mammals in the obsolete system of Cuvier, comprising those like the dogs, cats, civets, weasels, rodents, etc., which have the metacarpals and metatarsals greatly lengthened, and the foot otherwise modified, so as to lift the heel off the ground. The animal consequently walks upon its toes (digits), an adaptation to the requirements of captivity and speed. This form of foot appears very early in the history of the mammalian class, but has reached its highest development in more modern forms. The opposite condition, in which the whole sole of the foot rests upon the ground, as in bears, man, and others, is called "plantigrade"; but some animals, as those of the raccoon family, are intermediate between plantigrade and digitigrade in their method of standing and walking. The term no longer expresses a scientific classification.

Dijon, dē-zhôṅ (ancient DIBIO), France, chief town in the department of Côte-d'Or, and formerly capital of the old duchy of Burgundy. It is 196 miles southeast of Paris. Its importance as a railway centre has rendered it of consequence in the inner line of French defenses. Pop. (1901) 70,428.

Dika, dē'ka, a vegetable fat obtained from the seed of a West African tree, *Irvingia barteri*, used in making fine soaps. It resembles cacao-butter, and makes very hard soaps. The tree belongs to the *Simarubaceæ*, and has alternate, entire leaves and drupaceous fruits.

Dikamali, dĭk-a-măl'ĭ, a resin exuding from Indian trees of the genus *Gardenia*, especially *G. lucida* and *G. gummifera*, a solution of which is used to dress wounds and open sores. These trees belong to the order *Cinchonaceæ*.

Dike, Samuel Warren, American reformer: b. Thompson, Conn., 13 Feb. 1839. He was graduated from Williams College in 1863; and from Andover Theological Seminary in 1866. He was subsequently ordained as a Congregational minister. He was the founder of the Divorce Reform League, now known as the National League for the Protection of the Family, and has been its corresponding secretary from the first. He also established the home department of the Sunday School. He has written numerous papers for periodicals on marriage, divorce, the family, etc.

Di'ke, in Grecian mythology, the avenger of wrong, and the rewarder of virtue. She is the daughter of Zeus and Themis, and is considered one of the Horæ.

Dike, or Dyke, a word variously used to represent a ditch or trench, and also an embankment, rampart, or wall. It is specially applied to an embankment raised to oppose the incursions of the sea or of a river, the dikes of Holland being notable examples of works of this kind. Owing to the possibility of great loss of property and of life, the punishment of all neglect or for malicious mischief to dikes is extremely severe. The dikes which protect the Netherlands and the German coasts of the North Sea go back to the old Roman times. Apparently even before the Romans appeared the Batavians at the mouth of the Rhine protected themselves by dikes. Drusus after the conquest of Holland, 10 B.C., built an elaborate system of artificial canals and dikes. Pliny the Elder gives interesting descriptions of the artificial hills which were erected as places of refuge during the floods.

Among the provinces in North and South Holland which have been protected by dikes may be mentioned the Province of Hanover, 618 miles, protecting 770,000 acres of marsh land. On the left bank of the Oder River there is a dike which protects more than 170,000 acres of land. The dike at the delta of the Vistula protects 134,000 acres of land. On the Lower Rhine, between the Weser and Holland are 115,000 acres protected by dikes. Along the Loire River are 280 miles protecting 230,000 acres. Along the Po there are 310 miles protecting 850,000 acres. In England there are 1,750,000 acres protected by dikes. Many of the dikes of Holland are raised 40 feet above high-water mark and are wide enough at the top for a general roadway or canal, sometimes for both.

In the United States the term dike is almost wholly restricted to the structures of more or less permanence built in various ways in the bed of a stream to regulate its flow, narrow the low water cross section, concentrate the current, increase its local scouring effect and thereby deepen the river channel. The earthen embankments designed to restrain the flood waters are called levees. The most notable examples are found along the Mississippi River. These levees are placed some little distance back from the river, and according to the local conditions vary in height from 2 or 3 feet to over 20 feet. Levee building began many years ago along the lower part of the river and it has been carried on practically continuously ever since. Up to June 1900 the United States had

expended more than $15,000,000, and the various levee boards had expended between 1882 and 1900 more than $22,000,000. The length of the levee lines along the Mississippi River in 1900 was about 1,300 miles, and the area protected from overflow about 27,000 square miles. In the existing levees there were about 140,000,000 cubic yards of earth, and to complete the system and make the levees safe against the maximum possible flood would require about 120,000,000 cubic yards in addition, which it was estimated would cost about $20,000,000. See Reservoirs.

Dike. In geology, a dike is any elongated and relatively narrow body of igneous rock that was forced while molten into a fissure and hardened there. The rocks cut by the fissure may be either sedimentary or igneous, and a dike may be from a few inches to a hundred feet thick. Dike rocks, especially in thin dikes, have usually a compact texture due to the quick cooling. Quartz, porphyry, and basalt are the commonest dike rocks. Dikes are to be distinguished from veins which are fissures filled with minerals (quartz, calcite, etc.) deposited from solution; but some dikes of rocks containing much silica were deposited from igneous solutions containing the vapor of water, hydrochloric acid, etc., and such dikes may grade insensibly into true quartz veins. Dikes are of common occurrence in all regions of volcanic action and in mountain ranges, and as all manner of chemical changes may take place along the contact of a dike with the rock it cuts, dikes are often of importance in determining ore deposits. A well-known example is the relation of the iron ore bodies in many of the great mines of the Lake Superior region to the diabase dikes. So called sandstone dikes, found in California and elsewhere, represent fissures that have been filled in some way with sand. They are not true dikes. See Diabase; Ore Deposits; Quartz; Porphyry; Volcano.

Dikoa, dē-kō'a, Africa, a town in the northwestern part of Kamerun, about 25 miles south of Lake Chad. It is fortified and was at one time the residence of the ruler of the native kingdom of Bornu. Pop. 15,000 to 25,000.

Dilatation. See Heart-disease.

Dilem'ma (from Gr. *dis*, twice, and *lēmma*, an assumption), in logic, an argument in which the same conclusion may be drawn from two contrary propositions. A person is said to be in a dilemma, or on "the horns of a dilemma," when each of several courses of action would lead to an unsatisfactory result. We append one of the most famous of the classical dilemmas. A young rhetorician said to an old Sophist: "Instruct me in pleading and I shall pay you when I gain a cause." The master sued for the reward, and the scholar eluded the claim by a dilemma. "If I gain my cause I shall not pay you, because the award of the judge shall be against you. If I lose it I may withhold it, as I shall not have gained a cause." The master replied: "If you gain you must pay me, because you promised to pay me when you gained a cause; if you lose you must pay me, because the judge will award it." When the case came before the judges they were unable to decide it. See Logic; Paradox; Syllogism.

Dilettante, dī-lĕt-tän'tā, an Italian expression; in its original sense signifying a lover of the arts and sciences, who devotes his leisure to them as a means of amusement and gratification. The term was originally applied to a lover of Italian vocal music, and was at one time the name of a party which upheld the superiority of that class of music. In contemporary usage the word has come to mean more or less of an artistic trifler. In 1734 a number of gentlemen founded a Dilettanti Society in London, with the object of combining social intercourse with the cultivation of artistic knowledge. On the rapid accumulation of the funds, the members resolved, in 1764, to send out an expedition to collect details and drawings of the most remarkable artistic monuments of antiquity. Messrs. Chandler, Revett, Stewart, and Pars accordingly were sent to Asia Minor, and returned with the materials for the splendid work on Ionian Antiquities, published at the expense of the society, the first volume of which was issued in 1769: a second volume was published in 1797, and a third in 1840. Among other works published by the society are: 'Specimens of Ancient Sculpture, Egyptian, Etruscan, Greek, and Roman' (two vols. imp. folio; London 1809, 1835); the 'Unedited Antiquities of Attica' (imp. folio; London 1817); the 'Temples of Ægina and Bassæ' by C. R. Cockerell (folio; London 1860).

Diligence, the name originally given in French-speaking countries to a public conveyance of the nature of a stage-coach. The name was also adopted by other countries for their public carriages. The French diligence was a national vehicle going over regular routes periodically. It was a huge, heavy, cumbersome affair, upon four broad wheels which never covered a greater distance than six miles an hour. It had three compartments designed for the same number of classed passengers. Two officials accompanied the diligence on its trip; a *postillon*, who managed the horses, and a *conducteur*, who looked after the passengers and their traps.

Dilke, Sir Charles Wentworth, English politician: b. London 18 Feb. 1810; d. St. Petersburg, Russia, 10 May 1869. He was the son of C. W. Dilke (q.v.). One of the most active originators, as well as member of the executive committee of the Great Exhibition of 1851, he was sent in 1851 as a commissioner to the New York Industrial Exhibition, and in 1862 was one of the five royal commissioners for the second exhibition. In 1865 he was returned to Parliament for Wallingford, and in 1869 was sent to Russia as the representative of England, to the horticultural exhibition held at St. Petersburg. He was knighted in 1862.

Dilke, Sir Charles Wentworth, English writer and politician: b. Chelsea 4 Sept. 1843. He is a son of the preceding; was educated at Trinity Hall, Cambridge, and was shortly afterward called to the bar. His first work, 'Greater Britain,' the result of a tour round the world in 1866–7, became very popular. In 1868 he was elected M.P. for Chelsea, and he represented this constituency up to 1885. From 1880 till 1882 he was under-secretary for foreign affairs, and from 1882 till 1885 president of the local government board. After a few years'

retirement he became M.P. for Forest of Dean division of Gloucestershire in 1892. Sir Charles has played a not unimportant part in connection with various legislative measures. 'The Present Position of European Politics' (1887); 'The British Army' (1888); 'Problems of Greater Britain' (1890); and 'Imperial Defense' (with Spencer Wilkinson, 1891); 'British Empire' (1898); are among his works.

Dilke, Emilia Frances Strong, LADY, English art critic: b. Ilfracombe 2 Sept. 1840; d. Oct. 1904. She was married to Mark Pattison in 1862 and to Sir C. W. Dilke (q.v.) in 1885. She was for many years a writer for the 'Saturday' and 'Westminster' reviews, and at one time art critic of the 'Academy.' Her chief work is 'The Renaissance in France' (1879). Her other publications include: 'The Shrine of Death' (1886); 'Art in the Modern State' (1888); 'The Shrine of Love and Other Stories' (1891); 'French Painters of the 18th Century' (1899); 'French Architects and Sculptors of the 18th Century' (1900); 'French Decoration and Furniture in the 18th Century' (1901).

Dill, James Brooks, American corporation lawyer: b. Spenceport, N.Y., 25 July 1854. He was graduated at Yale in 1876, and from the law school of the University of the City of New York 1878. He has drafted, in whole or in part, the charters of more than 700 corporations and has written various monographs on matters connected with corporation law, among them: 'The Advantages of Business Corporations.' It was at his suggestion that New Jersey adopted the Corporation Registration Law, which gave New Jersey corporations the same protection afforded by the English system. See CORPORATIONS.

Dill (*Anethum graveolens*), the common name for an aromatic plant of the carrot family (*Umbelliferæ*). It is a native of Spain, but has been naturalized throughout the civilized world, where the climate is suitable for its growth. It is a particular favorite with the German people, who use it to flavor cucumber pickles, and therefore try to raise it wherever they may be living. In England it is used for the manufacture of gin, and to a small extent in medicine, as a carminative for children. An East Indian species is one of the ingredients in curry powder. It is a hardy biennial plant, growing upright. It has a single slender stem, and leaves finely divided or pinnatifid. The flowers, which form an umbel, appear in June or July. The seed is of an oval form, convex on one side, flat on the other, having three striæ on the outside, and surrounded with a small membranous border. Its taste is slightly acrid, and its odor stronger but less pleasant than that of fennel, to which it is closely allied. In America, where found out of gardens, it is a fugitive from cultivation, and is generally called fennel.

Dilleniaceæ, dil-lē-nī ā'sē-ē, an order of plants nearly related to the *Ranunculaceæ*, found chiefly in Australia, Asia, and the warm parts of America. Sepals five, persistent; petals five, deciduous, in a single row; seeds universally arillate; stamens indefinite, hypogenous. The species are trees, shrubs, or under-shrubs. The Indian species are remarkable for their beauty, the grandeur of their foliage, and the magnificence of their flowers. They have astringent properties, and some of the species afford excellent timber. Lindley enumerated 26 genera, comprising 200 species.

Dillenius, dil-lā'nē-oos, or **Dillen, Johann Jakob,** yō'hän yä'kōb, German botanist: b. Darmstadt 1687; d. Oxford, England, 2 April 1747. He was distinguished for his investigations into the propagation of plants, particularly cryptogamous plants. In 1721 he went to England, where he published several works, and particularly 'Hortus Elthamensis' (1732), in which the drawings, prepared by himself, are distinguished by the greatest faithfulness. His last work, on the mosses, 'Historia Muscorum,' added much to his reputation.

Dillingham, William Paul, American statesman: b. Waterbury, Vt., 12 Dec. 1843. He studied law, was admitted to practice in 1867, and was state attorney, Washington County, Vt., 1872–6. He was a member of the Vermont legislature 1876 and 1884; state senator 1878 and 1880; commissioner of State taxes 1882–8, and governor of Vermont 1888–90. Since 1890 he has been president of the Waterbury National Bank. He was elected United States senator in October 1900 to fill a vacancy caused by the death of Justin S. Morrill.

Dillmann, dil'män, **Christian Friedrich August,** German Orientalist: b. Illigen, Würtemberg, 25 April 1823; d. 4 July 1894. In 1854 he accepted a call to Kiel, where he became professor of Oriental languages in 1860, but was transferred in 1864 to the chair of Old Testament exegesis at Giessen, which in 1869 he resigned to become Hengstenberg's successor at Berlin. Dillmann was beyond question the first authority in Europe on the Ethiopic languages. The best books for the student in this department of learning are his: 'Ethiopian Grammar' (1857); 'Ethiopian Dictionary' (1865); and his 'Ethiopian Selections' (1866). Other works (1879–84) deal with the history of the Ethiopic kingdom of Axum.

Dillon, John, Irish politician, son of John Blake Dillon, who was a prominent member of the Young Ireland party, and member of the British Parliament for County Tipperary in 1865–6: b. New York 1851. He early identified himself with the Parnellite movement, and in 1880 was elected to Parliament for County Tipperary. In the House of Commons Dillon soon became prominent for the violence of his language, while speeches delivered by him in Ireland led to his imprisonment in 1881, 1881–2, and 1888. From 1883 to 1885 he was absent from political life on account of ill-health; but in the latter year he reappeared and was elected for East Mayo. He was one of the most prominent promoters of the "Plan of Campaign." In 1896 he succeeded Justin M'Carthy as chairman of the main section of the Nationalist Party.

Dillon, John Forrest, American lawyer: b. Montgomery County, N. Y., 25 Dec. 1831. Going to Iowa in early youth, he was graduated at the medical department of Iowa University, but soon gave up medical practice and studied law, being admitted to the bar in 1852. He was State prosecuting attorney 1852–8; judge of the supreme court of Iowa 1863–9; and judge of the United States circuit court, 8th judicial

district, 1860–70, when he resigned. From 1879–82 he was professor of real estate and county jurisprudence in Columbia Law School, and has since then practised law in New York, being general counsel of the Missouri Pacific Railway Company; and the Western Union Telegraph Company; and consulting counsel of the Manhattan Elevated and Pacific Railway companies. Among his works are: 'United States Circuit Court Reports'; 'Municipal Corporations'; 'Removal of Causes from State to Federal Courts'; 'Municipal Bonds'; and 'Laws and Jurisprudence of England and America.'

Dilman, dēl'man, Persia, city in the province of Azerbijan, 75 miles west of Tabreez. It is of considerable extent, and is surrounded by gardens. Pop. estimated at 10,000.

Dilolo (dē-lō'lō) **Lake**, a small body of water in Central Africa, discovered by Dr. Livingstone (1854). Its altitude is nearly 5,000 feet above the sea. It is supposed to be connected with both the Zambesi and Congo rivers.

Dil'uents, remedies that increase the proportion of fluid in the blood. They are employed in fevers to lessen thirst and increase secretion, and are used in certain acrid affections of the stomach and intestinal regions. Water is the only real diluent, though it may be given in various forms — soups, barley-water, toast-water, milk, lemonade.

Dilu'vium, a term first used by the English geologist Buckland in 1823, and applied by him to the deposits between the Tertiary system and those now in process of formation. He regarded them as the discharge from a universal flood. The diluvium thus includes the boulders, sands, and clays which Lyell included under the name Pleistocene and Morlot under the name Quaternary. Though the term diluvium is no longer used, the adjective diluvial is still employed, especially by foreign geologists. See Glacial Period; Pleistocene; Quaternary.

Dime (Fr. *dime*, contraction of *dixième*), a silver coin of the United States, of the value of 10 cents, or one tenth of a dollar. It was first coined in 1796 in pursuance of the act of 2 April 1792, though pattern pieces were struck in 1792. Its legal standards have been as follows: by act of 2 April 1792 fineness 892.4 thousandths, weight 41.6 grains; by act of 18 Jan. 1837 fineness 900 thousandths, weight 41¼ grains; by act of 21 Feb. 1853 fineness 900 thousandths, weight 38.4 grains. See Coin; Numismatics.

Dimensions, a term used in physics in expressing the mode of dependence of a secondary unit upon the fundamental units from which it is derived. Thus the volume of a rectangular solid is found by multiplying the length by the breadth, and this product again by the thickness; or, in other words, by forming a product that is composed of three factors, each of which is a length. This is expressed, in the terminology of modern physics, by saying that volume (or "bulk") is of the "dimensions" L^3; or that it is of dimensions $+3$ in length. Similarly, the speed with which a body is moving is found by dividing some particular distance that is traversed by the body, by the time that is required to traverse it. The "dimensions" of speed are therefore said to be LT^{-1}; or speed is said to be of dimensions $+1$ in length, and -1 in time. Three fundamental units are required in order to express the ordinary units of mechanics in this way. Some latitude is possible in their selection, but most writers adopt (1) a definite mass, (2) a definite length, and (3) a definite interval of time. An example of a mechanical unit that contains all three of these units is afforded by energy. The kinetic energy of a body is found by multiplying a mass by the square of a velocity; and hence the dimensions of energy are expressed by the formula ML^2T^{-2}, so that energy is of the dimensions $+1$ in mass, $+2$ in length, and -2 in time. As an example of the determination of the dimensions of a quantity by indirect means, force may be considered. Work is defined as the product of force and distance; so that it may be written FL. Now energy, since it is capable of becoming transformed into work, must be of the same dimensions as work; and hence we must have $FL = ML^2T^{-2}$, from which it is easily seen that $F = MLT^{-2}$. In other words, force is of dimensions $+1$ in mass, $+1$ in length, and -2 in time. The correctness of this result is easily verified by direct calculation. Thus momentum, being the product of a mass by a velocity, is of the dimensions MLT^{-2}; and since force is measured by the increase of momentum that it can produce in a given time (or, in other words, force is determined by dividing a given change of momentum by the time required to produce that change), the dimensions of force must be $MLT^{-1} \div T = MLT^{-2}$, which is identical with the result previously obtained. The theory of dimensions is of great importance in connection with problems involving a change of the fundamental units from one system to another; as, for example, in translating the values of physical quantities that have been determined in the metric system, into their equivalents as expressed in the system of units in use in England and the United States. For these important applications, and for the extension of the fundamental principles to the discussion of problems in electricity and magnetism, consult J. D. Everett, 'Units and Physical Constants.' See Units.

Dimet'rodon, a primitive reptile of the Permian period in which the neural spines of the vertebræ are greatly elongated, making a high rigid fin on the back. The teeth indicate carnivorous type habits, and the animal appears to have been terrestrial or amphibious. In the allied *Naosaurus* a series of short cross-spines project on each side from the neural spine, like the yards of a ship from the masts. The use of this very curious structure is quite unknown. The animal attained a length of 10 or 12 feet.

Dimin'utive, in grammar (Latin, *diminutivum*), a word formed by adding a suffix conveying the idea of littleness and other connected ideas, as tenderness, affection, contempt, etc. The opposite of diminutive is augmentative. In Latin, diminutives almost always ended in *lus*, *la*, or *lum*; as *Tulliola, meum corculum*, little Tullia, my dear or little heart.

The Italian is particularly rich in diminutives and augmentatives: *ino, etto, ello*, convey the idea of smallness, dearness, etc.; *one*, of largeness; *uccio*, sometimes of smallness, with reproach, but often without it; *accio* signifies that the thing is disgusting, unpleasing, etc.; for

example, *casa* is a house; *casetta, casina, casella,* a small house, nice little house; *casone,* a large house; *casuccia,* a small, insignificant house; *casaccia,* an ugly house. That expressive tongue can compound two or three of these endearing affixes; and travelers may frequently hear little Italian children form almost endless words, as if overflowing with tenderness; for instance, *fratellinucciettinctto.* Adjectives also can receive the diminutive termination; as *carino, carinuccio,* from *caro.* In Spanish there are similar diminutives, augmentatives, and other affixes. Thus from *hombre,* a man, are formed the augmentatives *hombron, hombrazo, hombronazo, hombrachon;* and from *muger,* a woman, *mugerona, mugeraza, mugeronaza.* Diminutives in *ito* and *ico* usually denote endearment or tenderness, as those in *illo* do sometimes; those in *clo* always denote contempt. In Portuguese the diminutives and augmentatives correspond to those of the Spanish language. In French there are many diminutives formed from other words; as, *tablette,* of *table, charette* of *char;* but there is no general affix which can be added to every substantive. The German has the syllables *chen* (in Low German, *ken,* with which corresponds the English *kin,* as in *manikin,* and some other words), *lein* and *el,* for substantives; *lich,* etc., for adjectives; *lich* corresponds to the English *ish* or *like;* for instance, *rundlich,* roundish or roundlike (from *rund,* round). The German even adds the diminutive to pronouns, and nurses will sometimes say *duchen,* from *du,* thou.

The English language affords examples of diminutives, but has no affix which can be used at pleasure to convey this idea. Those commonly used are *ock, kin, el, ling,* and *et;* as in bullock, lambkin, kernel, gosling, and tablet. Diminutives of proper names are also formed, in colloquial and familiar language, by adding *y* or *ie* to the names, as *Charley, Johnny,* etc.

Dimitry, Charles Patton, American novelist: b. Washington 31 July 1837. He was educated at Georgetown College, and after serving as a private in the Confederate army, was connected with newspapers in several cities of the North and South. He is State historian of the Louisiana Society of the American Revolution. Among his works are: 'Guilty or not Guilty'; 'Angela's Christmas'; 'Gold Dust and Diamonds'; 'The House in Balfour Street'; 'Louisiana Families'; 'Louisiana Story in Little Chapters.'

Dimitry, John Bull Smith, American author and editor: b. Washington, D. C., 27 Dec. 1835; d. New Orleans 7 Sept. 1901. He entered the Confederate army of Tennessee in 1861, serving till 1864, being wounded at the battle of Shiloh. He resided in the United States of Colombia 1874–6, filling the position of professor of languages in the Colegio Caldas, Barranquilla. He was long connected with the press, being for seven years dramatic and literary editor of the New Orleans *Times,* and wrote a 'History and Geography of Louisiana,' which has been used as a text-book.

Dimity (Gr. *di-* double, *mitos,* thread; literally, made with a double thread), a stout cotton fabric, ornamented in the loom either by raised stripes or fancy figures: stripes are the most common, as the mounting of the loom is much simpler and the texture can be produced at less expense. It is rarely dyed, but usually employed white, as for bed and bed-room furniture. There is also a much finer cotton stuff on the market to-day which is manufactured for summer-dress material.

Dimmesdale, dĭmz'dāl, **Arthur,** the erring clergyman in Nathaniel Hawthorne's tale, 'The Scarlet Letter' (q.v.).

Dimor'phism (from the Gr. *dimorphos,* of double form), in crystallography, the crystallization of a body in forms belonging to two different systems, or in incompatible forms of the same system. In biology, the occurrence of individuals of the same species in such a form, that, were not their relation known, they might be considered as separate and distinct in species and even in genera. Thus, in sexual dimorphism, the male and female of the same species present distinct characters, the male may be winged, the female wingless.

Dimor'phodon, a genus of Lias bird-like reptiles, found in the south of England. The large head has powerful jaws, with large anterior teeth which are pointed, and small posterior teeth which are lancet-shaped. This is the earliest of the reptiles that were capable of flight. See PTERODACTYL.

Dimsdale, Thomas, English physician: b. Essex 6 May 1712; d. Hertford 30 Dec. 1800. He published: 'The Present Method of Inoculation for the Smallpox' (1767). He was famous as an inoculator, making journeys in 1768 and 1784 to Russia to inoculate the Empress Catharine and other magnates.

Dinah Morris, the heroine of George Eliot's novel, 'Adam Bede' (q.v.). She is a factory girl and at the same time a lay preacher whose purity, spirituality, strength, and tenderness have an uplifting influence on all who come in contact with her. The beauty of her character is especially developed in her intercourse with the guilty and condemned Hetty Sorrel (q.v.). Elizabeth Evans, an aunt of George Eliot, appears to have been the original from whom the character was drawn.

Dinajpur, dē'näj-poor, or **Dinagepore,** India (1) A district in the Rajshahi division. Area 4,118 square miles; pop. 1,555,835. (2) A city and capital of the district, 205 miles north of Calcutta. Pop. 12,204.

Dinan, dē-näṅ (ancient DINNANUM, fortress on the water), a town in the department of Côtes-du-Nord, France, 16 miles south of St. Malo. It is noted more for its trade than for its manufactures. Pop. 10,000.

Dinant, dē-näṅ or dē-nänt', Belgium, a town in the province of Namur, on the Meuse, 14 miles south of the city of Namur. It was fortified as early as the 12th century. In 1466 Philip the Good, Duke of Burgundy, besieged it with 50,000 men; and having taken it by assault, razed it to the ground, and threw 800 of its inhabitants, tied in pairs, back to back, into the Meuse. Paper-mills, tanneries, breweries, and bake-shops are the chief industries. It is noted for its gingerbread made of rye flour and honey. Pop. 7,208.

Dinapac, dē-nä-păk', or Guinapak, Rocks, Philippines, two tower-like rocks, lying east of Camiguin Island, north of Luzon. On 2 Nov. 1899, the United States ship Charleston struck an uncharted coral reef three miles north of

Dinapore Rocks and was totally wrecked. All signs of the wreck disappeared in a heavy typhoon a few weeks later.

Dinapur, dē-nä-poor, India, a city in the district of Patna, on the Ganges, about 12 miles northwest of Patna. It is one of the great stations of the British army in India. Pop. 44,419.

Dinar, dē-nar' or dī'nėr (Lat. *denarius*), formerly an Arab gold piece weighing about 65.4 grains troy. Also a Persian coin. It is now the name of the chief Persian coin, value one franc.

Dinar'chus, Greek orator: b. Corinth 361 B.C.; d. Athens 291 B.C. He studied under Theophrastus, and was most successful during the reign of Demetrius Phalereus. After the fall of Demetrius he fled to Chalkis, and returned to Athens in 292 B.C. Of his speeches, of which there were probably about 60, only three are preserved, one of them directed against Demosthenes.

Dinar'ic Alps, the name applied to the mountains connecting the Julian Alps with the Balkan system. The main range stretches from northwest to southeast, separating Dalmatia from Bosnia and Herzegovina, as far as the mouth of the Narenta. The mountains are principally calcareous; the highest summits are Orjen 6,225 feet, and Dinara 5,940 feet.

Dinas Bricks are highly valued on account of their refractoriness or infusibility. They are made of a peculiar rock, containing 98 per cent of silica, with a little alumina, which occurs at Dinas in the vale of Neath, Wales. This fireclay brick is very highly esteemed on the other side of the Atlantic. An imitation of it is made in Austria from quartz rock.

Dincklage-Campe, dĭnk'läg-ĕ-käm'pĕ, **Amalie (Emmy) von**, German novelist: b. Campe, Osnabruck, 13 March 1825; d. Berlin 28 June 1891. Her first novel, 'The Loving Old Couple,' was published in 1857. Though she traveled extensively and observantly in Europe and America, her themes for stories were nearly all from her own countryside; and she is called "the poetess of the Ems valley." Among her works are: 'The School of the Heart'; 'Tales of Home'; 'Pictures of Emsland'; (posthumously) 'Poems'; a story, 'The Woman Nihilist' (1893).

Dindigal, India, a city in the Madura district, Madras, with a fort on a rocky height. It manufactures cigars, and trades in tobacco and coffee. Pop. 20,203.

Dindings, dĭn-dĭngz', The, a British possession belonging to the Straits Settlements, consisting of two small islands and a strip of land on the coast of Perak on the west side of the Malay Peninsula; area about 200 square miles. See STRAITS SETTLEMENTS.

Dindorf, Wilhelm, vĭl'hĕlm dĭn'dōrf, German classical scholar: b. Leipsic 2 Jan. 1802; d. there 1 Aug. 1883. He became in 1828 professor of literary history at Leipsic, but resigned in 1833 in order to devote himself entirely to literary work. He contributed to the edition of Aristophanes by Invernizzi and Beck (1820–34), and between 1835 and 1830 published at Oxford an edition of the same poet. Other works by him are editions of Æschylus (1841–51); Euripides (1834–63); Sophocles (1832–6); and Demosthenes (1846–51); 'Lexicon Sophocleum' (1871); 'Lexicon Æschyleum' (1873–6); and a new edition of Stephens' 'Thesaurus Linguæ Græcæ' (1831–65).

Dindymene. See CYBELE.

Dingelstedt, Franz von, frănts fŏn dĭng'ĕl-stĕt, BARON, German poet and dramatist: b. Halsdorf, Upper Hesse, 30 June 1814; d. Vienna 15 May 1881. His 'Songs of a Cosmopolitan Nightwatchman' (1841) shocked all officialdom, but had a great popular success; and his 'Poems' (1845) showed true poetic feeling and great descriptive power, the latter also visible in his travel sketches and stories; one of the most successful of the latter is 'The Amazon,' a society novel. His tragedy, 'The House of the Barneveldts' (1851) was a splendid success. He adapted plays from Molière, Shakespeare, and others, to the German stage, and wrote a volume of 'Studies and Copies After Shakespeare.'

Dingle, Philippines, a city of Panay, in the province of Iloilo; on Jalaur River, 18 miles north of the city of Iloilo. Pop. 11,000.

Dingler, Johann Gottfried, yō'hän gŏt'frēd dĭng'lĕr, German chemist: b. Zweibrücken 2 Jan. 1778; d. Augsburg 19 May 1855. From 1806 to 1820 he conducted journals for calico printing, dyeing, and bleaching, and in 1820 began the well-known periodical called after him 'Dingler's Polytechnic Journal,' which at the time of his death had reached the 140th volume. The journal he founded still continues.

Dingley, Nelson, American legislator: b. Durham, Maine, 15 Feb. 1832; d. Washington, D. C., 13 Jan. 1899. He was graduated from Dartmouth College in 1853; admitted to the bar in 1856; purchased the Lewiston 'Journal' in 1856; edited a daily edition in 1865; and was its editor and proprietor till his death. He was elected to the State legislature in 1861; served in that body till 1865 and in 1868 and 1873, and was speaker of the House in 1864–5. He was elected governor of Maine in 1873, and re-elected in 1874; and was a member of Congress from 1881 till his death. From the beginning of his congressional career he was conspicuous as an advocate of the principle of protection and was author of the Dingley Bill (q.v.) of 1897. In 1898 he was appointed a member of the Joint High Commission.

Dingley Bill, The, in American history, a tariff law, enacted by Congress in 1897, and so named after Nelson A. Dingley who introduced the bill. The Dingley Bill was a revision of the Wilson and McKinley bills and increased the customs duties on wearing apparel and manufactured goods generally. See UNITED STATES — TARIFF IN THE.

Dingo, the Australian wild dog (*Canis dingo*), the only species of dog known to exist in both the wild and the domesticated states. It is sometimes considered as being of Asiatic origin, the theory being that it was brought to Australia by the first men who came there, and that it has since become wild. It is not found in Tasmania or New Zealand, in which the fauna is generally like that of Australia. The dingo has decreased in numbers, retreating before the advance of civilization, and suffering from the war made upon it by the settlers, whose flocks it preys upon. The animal is about two

and a half feet long, and nearly two feet high; has large erect ears and a bushy tail. It is tawny in color; some specimens, however, being pale and others almost black. In the wild state it is especially crafty and courageous, and hunts in packs sometimes containing 100 dogs. The native Australians seek the young dingoes, and having taken them from the lairs where they are found, bring them up as domestic animals. When well treated they are affectionate and trustworthy, and are used to help their masters in hunting the animals on which the natives live — opossums, snakes, lizards, etc. While the domesticated dingo is his friend and companion, the native Australian will hunt the wild dog, kill him, and having roasted him, will eat him with a keen appetite. Consult: Lydekker, 'New Natural History,' Vol. I. (1897). See Dog.

Dingrás, Philippines, city in the province of Ilocos Norte, in Luzon, 11 miles southeast of Laoag. It is on the Grande de Laoag River. The surrounding country is fertile. Pop. 12,600.

Dinichthys (Gr. *δεινός*, terrible; *ἰχθύς*, fish), a genus of enormous fossil fishes found in Carboniferous and Devonian rocks. They are usually classed with the Dipnoi (q.v.) as members of the order *Arthrodira.*

Dinic'tis, a genus of sabre-tooth tigers of the Oligocene Epoch in North America. The animal was as large as a Canada lynx, and of somewhat the same proportions, but with long tail. Its teeth were less specialized than in the later sabre-tooth tigers or the modern cats, 34 being retained out of the 44 which all primitive mammals possessed. It has many characters allying it with the civets (*Viverridæ*), and especially with the fossa (q.v.) of Madagascar, indicating the descent of cats and civets from a common ancestor.

Diniz, dē'nēs, **Julio,** pseudonym of **Joaquim Guilherme Gomes Coelho,** Portuguese novelist and poet: b. Oporto 14 Nov. 1839; d. there 12 Sept. 1871. He introduced the village story into Portuguese literature. His first work: 'The Rector's Wards' (1866), is also his best; it was followed by 'An English Family' (1867), describing middle-class life in Oporto. His poems were published in 1880.

Diniz da Cruz e Silva, Antonio, än-tō'nē-ō dē'nēs dä kroos ē sēl'vä, Portuguese poet: b. Lisbon 4 July 1731; d. Rio Janeiro, Brazil, 5 Oct. 1799. A lawyer and official, in 1776 he was made counsel to the superior court at Rio Janeiro. He was one of the founders of the celebrated literary society, the Lisbon Arcadia. His poetry comprises sonnets, eclogues, elegies, songs, epigrams, epistles, and several volumes of Pindaric odes; a lengthy poem, 'Brazil's Metamorphoses'; and a heroicomic epic, 'Hyssop,' — modeled on Boileau's 'Lutrin,' but a spirited, original composition, far superior to Boileau's, — which was republished several times in France, and translated into French prose.

Dinka, a powerful tribe of Negritos who live on both sides of the White Nile between lat. 6° and 12° N. Their territory covers 60,000 square miles. They are intelligent, have some skill in making articles for household use, and also follow agriculture. Each village is governed by its own chief. Consult: Schweinfurth, 'In the Heart of Africa.'

Dinkard (the enactments of religion), an important compilation of information concerning the doctrines, customs, and writings of the religion of Zoroaster. In its present form, much of the work is a descriptive list of the contents of a larger and earlier work.

Dinocer'ata (Gr. *δεινός*, terrible, and *κέρας*, horn), an extinct order of mammals, approaching the elephant in size and movements, remains of which have been found extensively in the Eocene lacustrine sediments of southern Wyoming. The dinocerata include three genera — *Uintatherium* (most primitive type), *Dinoceras* (intermediate form), and *Tinoceras* (youngest and most specialized). About 30 more or less distinct forms have been recognized.

Dinorah, dē-nō'rä, the title of an opera by Meyerbeer, produced in Paris 4 April 1859. The opera is now rarely presented. Its single effective scene is a shadow dance, with accompanying song.

Dinor'nis, a genus of large wingless birds, classed among the *Struthionidæ* or ostrich tribe, the fossil bones of various species of which have been found in New Zealand. These birds had bones devoid of air-passages, were three-toed, and some of them must have been of immense size. The *D. giganteus,* for example, is estimated to have been about 12 feet tall. See Dinornithes.

Dinornithes. A group of extinct, flightless, ratite birds of gigantic size, the moas of New Zealand, with small heads, stout legs, usually with a hallux, wings absent or extremely reduced, furculum absent, and aftershafts large. The genera were *Dinornis Pachyornio, Mesopteryx, Anomalopteryx* and *Megalopteryx.* See Moa.

Dinosauria, dī-nō-sâ'rĭ-ạ, an extinct order of *Reptilia,* with many characters allying them to birds in the structure of the skull and skeleton. The body was covered with scales or bony plates, the limbs long and stilted, the tail massive, and equaling or exceeding the rest of the body in length. Many of them were of gigantic size, beyond that of any other land animals living or extinct, and exceeded only by the whales. During the Triassic, Jurassic, and Cretaceous periods, this group was the dominant form of terrestrial life, occupying the same relative position as did the mammalian quadrupeds during the Tertiary, or as does man at present. The most ancient known dinosaurs of the Triassic Period were carnivorous land animals of moderate size, and comparatively light and agile; later appeared huge, massive herbivorous quadrupedal and bipedal types, some scale-covered, others with heavy bony plates, spines, horns, and frills to protect them against their carnivorous enemies. They disappeared at the close of the Cretaceous Period, leaving no descendants or near relatives. Like other reptiles, they appear to have been cold-blooded, slow-moving, and unintelligent compared with the mammals which succeeded them, and less able to adapt themselves to the new conditions of life brought about by gradual changes of climate during geologic time. Their extinction paved the way for the predominance of the mammals and their evolution into the various modern races.

Dinosaurs are divided into three or four orders or sub-orders of very diverse appear-

ance. (1) *Sauropoda*, or amphibious dinosaurs, quadrupedal, herbivorous, with long neck, small head, weak teeth, short elephantine five-toed feet, and blunt claws. These have been found only in Jurassic and Lower Cretaceous strata, and include the largest members of the sub-class. *Brontosaurus*, *Diplodocus*, *Camarasaurus*, and *Morosaurus* are the best known. (2) *Theropoda*, or carnivorous dinosaurs, bipedal, carnivorous, with sharp teeth, bird-like hind legs and feet, three-toed or four-toed, and large sharp claws on both fore and hind feet. It includes *Megalosaurus*, *Allosaurus*, etc. (3) *Predentata*, or beaked dinosaurs, herbivorous terrestrial hoofed types with the front of the jaws covered by a horny bill or beak. These include the most highly specialized and bizarre forms, and were the latest development of the order, found chiefly in the Cretaceous Period. They are divided into three groups: (a) *Iguanodonta*, unarmored, bipedal, with small fore limbs and three-toed bird-like feet (but with hoofs instead of claws). *Iguanodon*, *Claosaurus*, and *Hadrosaurus* are the best known, each about 30 feet long. The skull of *Hadrosaurus* is four feet in length, and behind the horny beak is a magazine of several rows of small rod-like teeth set on end close together and wearing to a tessellated grinding surface like a mosaic pavement. (b) *Stegosauria*, heavy, quadrupedal, with five-toed elephantine feet, small head, large projecting bony plates on the back, and stout spines on the tail. The teeth are small and weak, somewhat like those of the iguana. *Stegosaurus* is the best known. (c) *Ceratopsia*, heavy, quadrupedal, with elephantine feet and very large head, with enormous horns projecting forward, and a great bony frill projecting backward and upward, and completely covering the short thick neck. The skull of *Triceratops* is sometimes eight feet long. The teeth of the *Ceratopsia* are like those of the iguanodonts, but larger and with fewer rows.

The brain in dinosaurs was disproportionately small, especially in the herbivorous types, and indicates a lower order of intelligence than in most modern reptiles. It is greatly exceeded in size by the spinal ganglia in the sacrum which govern the reflex (automatic) movements of the hind limbs and tail. Hence we may infer that the actions of these creatures were largely automatic and unintelligent, and this explains in part why they were unable to adapt themselves to the changes in physical geography, climate, and vegetation which ushered in the Cenozoic or modern era of geological time, and became totally extinct.

Comparatively little was known about the dinosaurs before 1880, but since that time the exploration and research of American paleontologists, and especially of the late Prof. O. C. Marsh in the fossil fields of Wyoming, Colorado, and other western States, have greatly extended our knowledge, and shown how important a part these creatures played in geological history. The proper collecting of these huge skeletons, and their extraction from the rock without injury, is a difficult and tedious operation, and requires considerable funds, so that only a few well-equipped museums have been able to afford it. The chief collections in this country are in the museums of Washington, New York, New Haven, Pittsburg, and Chicago. It is not yet practicable to trace the evolution of the different races of dinosaurs, as has been done with most of the mammal races, and much remains to be discovered as to the structure and habits even of the better known species.

W. D. Matthew,
American Museum of Natural History.

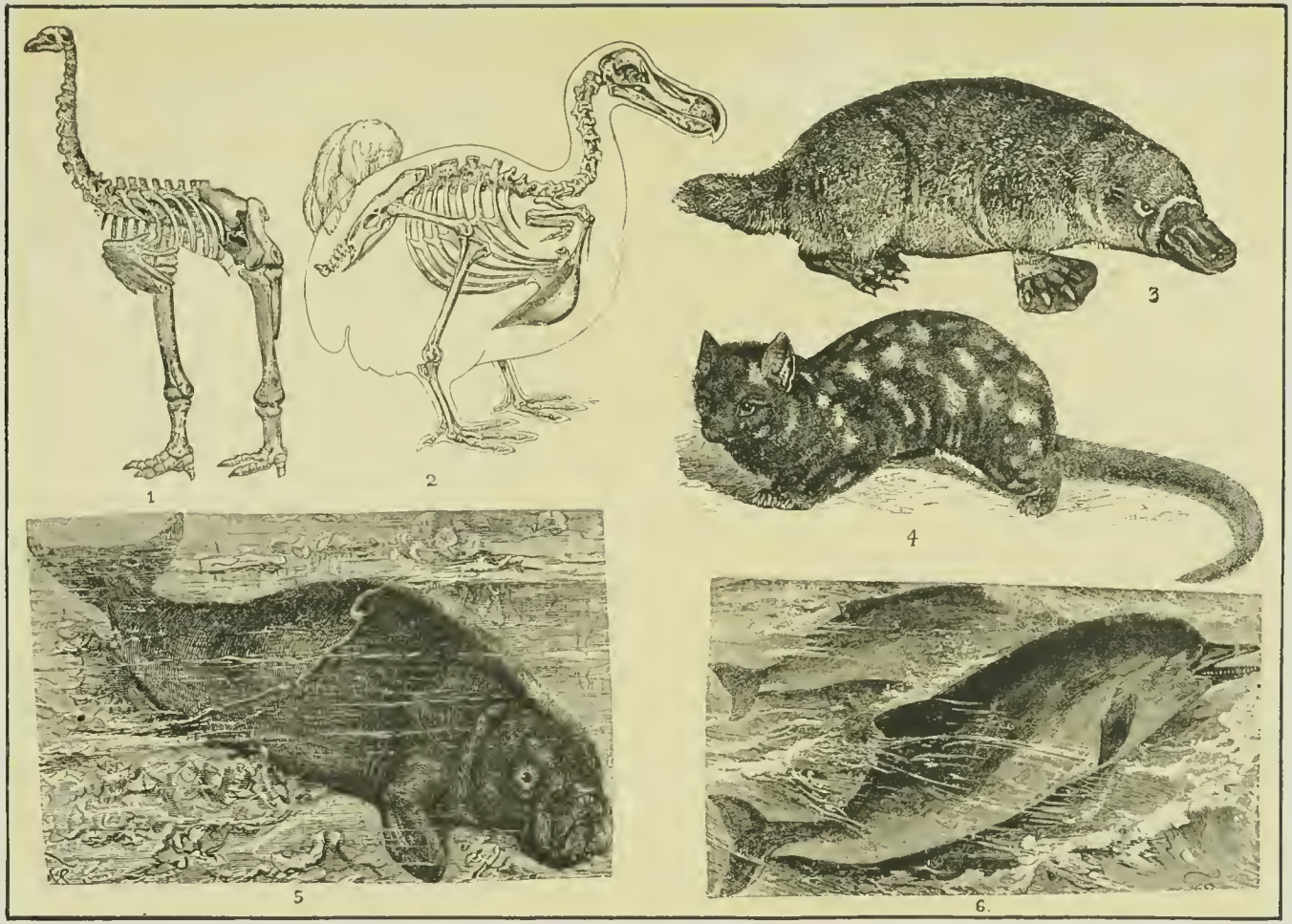
Dinotherium (Gr. δεινός, terrible; θηρίον, beast), a genus of elephantine mammals occurring as fossils in the Tertiary rocks of Europe and India, characterized by having the lower incisors developed into dome-curving tusks and by having all the molar teeth in use at once. They probably had a proboscis like that of the elephants.

Dinsmore, Hugh Anderson, American lawyer: b. Benton County, Ark., 24 Dec. 1850. He was clerk of the circuit court 1873–4, when he was admitted to the bar, and began practice in Fayetteville; was prosecuting attorney of the 4th judicial district of Arkansas in 1878–84; a Democratic presidential elector in 1884; minister-resident and consul-general in the kingdom of Korea in 1887–90; and a member of Congress in 1893–1903.

Dinwiddie, Robert, British colonial official: b. Scotland about 1690; d. Clifton, England, 1 Aug. 1770. He was lieutenant-governor of Virginia 1752–8; and during his official career recommended the annexation of the Ohio valley and the erection of forts to secure the western frontier against the French. He was one of the most earnest supporters of the French and Indian war, which began about 1753 and lasted 10 years.

Dinwiddie, William, American journalist and author: b. Charlottesville, Va., 23 Aug. 1867. When only 14 years of age, he was assistant electrician of the National Museum at Washington. He became inspector of customs at Corpus Christi, Texas, in 1883; was connected with the Bureau of American Ethnology from 1886 to 1895, at which time he went into journalism, serving as correspondent and illustrator for the New York *Herald*. He became photographer for the Baltimore & Ohio Railroad in 1897. During the campaign in Cuba and Porto Rico he served as war correspondent. He has published: 'Puerto Rico and Its Possibilities'; 'The War in the Philippines'; 'The War in South Africa.'

Dinwiddie Court-House and White Oak Road, Battles of. Gen. Grant, while besieging Petersburg, issued orders 24 March 1865 for a movement on the 29th to destroy the railroads leading into the city from the south, force Gen. Lee to come out of his entrenchments and fight on open ground, or so far attenuate his line that a successful assault could be made. The result was the battle of Five Forks (q.v.), the fall of Petersburg and Richmond, the surrender at Appomattox, 9 April and the close of the Civil War. The movement to the left was led by Warren's Fifth corps and Sheridan's cavalry, and the first encounter was near the Boydton road, where Warren's leading division (Griffin's) defeated two brigades sent out from Lee's right, driving them back to White Oak road. On the 30th the Second and Fifth corps closed in on the White Oak road on Lee's right, and Wilcox's Confederate division, coming out of the entrenchments, attacked Warren and was driven back. Warren's advance division was now within 600 yards of the road, and, on the



1. Skeleton of the Elephant-footed Dinornis.
2. Skeleton and Outline of the Dodo.
3. Duckbill (Ornithorhynchus anatinus).
4. A typical Paradoxure (Dasyurus viverrinus).
5. Manatee (Manatus americanus)
6. Dolphin (Delphinus delphis)

31st, Lee ordered another attack. Hunton's and Wise's brigades attacked in front, and McGavan's and Gracie's on the left flank. Ayres' and Crawford's divisions were driven back in disorder upon Griffin's division, which checked the Confederate advance. Gen. Miles, with two brigades of the Second corps, struck Wise's brigade on the left flank, drove it back with severe loss in killed and wounded, and the entire Confederate attacking party retreated, and Warren, resuming the offensive, pushed his advance across the White Oak road. It cost the Second and Fifth Union corps, on the 31st, 1,311 killed and wounded, and 556 missing.

Meanwhile Sheridan had reached Dinwiddie Court-House, 12 miles southwest of Petersburg, and on the 30th Devin's division and Davies' brigade were pushed 10 miles in advance in the direction of Five Forks, where they encountered the Confederate cavalry under Gen. Fitz Hugh Lee. At night Gens. W. H. F. Lee and Rosser joined Fitz Hugh Lee, and Gen. Pickett, with five brigades of infantry, marched down the White Oak road to Five Forks, and assumed command of all the troops operating against Sheridan. Munford's cavalry division engaged Devin in front and Pickett moved with infantry and the other two divisions of cavalry to gain Sheridan's left, crossed Chamberlain's creek, struck Davies' brigade in flank and drove it back on Devin, interposed between Devin and Crook, and with the assistance of Munford drove both Davies and Devin northeastwardly across the country. Fitz Hugh Lee moved up and formed his cavalry on Pickett's flanks. In following Devin and Davies, Pickett had exposed the rear of his column and it was attacked by the brigades of Gibbs and Gregg, which attack forced Pickett to face about. He drove back the two brigades and advanced upon Dinwiddie Court-House. Sheridan had called up Custer with his two brigades, some artillery had come up, and a barricade was thrown up about three fourths of a mile northwest of the court-house, behind which Gibbs and Gregg rallied, and Smith's brigade, slowly driven back by the Confederate cavalry, formed on the left. It was now near sunset, and as Pickett advanced, artillery opened upon him, and when within short range the cavalry from behind the barricades poured such a shower of bullets upon him that he was quickly repulsed, and the battle of Dinwiddie Court-House was over. Sheridan says his loss was about 450. The Union forces engaged at Dinwiddie Court-House and White Oak Road numbered about 42,000; the Confederates about 20,000. The Union loss 29–31 March was 2,198 killed and wounded, and 583 missing. The Confederate loss is unknown. Consult: 'Official Records,' Vol. XLVI.; Humphreys, 'The Virginia Campaign of 1864–5'; Walker, 'History of the Second Army Corps'; Powell, 'History of the Fifth Army Corps'; Grant, 'Personal Memoirs,' Vol. II.; Sheridan, 'Personal Memoirs,' Vol. II.; the Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Di'ocese, the territory and population over which a bishop exercises jurisdiction. The word diœcesis was originally a term of civil administration, when toward the end of the 3d century the Roman empire was divided into 12 diœceses governed by the emperor's lieutenants, each diœcesis comprising several of the divisions called provinces. When the word came into ecclesiastical use it signified rather one of the grand divisions, patriarchates or primatial jurisdictions, instead of the territory presided over by one of the bishops subject to a patriarch or primate or an archbishop. The word began to be used in the meaning it now has in the latter part of the 13th century; but even later it was used in the sense of our present word parish.

Diocle'tian (Gaius Aurelius Valerius Diocletianus, surnamed **Jovius)**, Roman emperor: b. Diocl'ea, Dalmatia, 245 A.D.; d. near Salona, Dalmatia, 313. He was made emperor by the army 284 A.D., and was generally beloved for the goodness of his disposition. But troubles disturbed the Roman empire, and compelled him to share the burden of government with colleagues; at first with M. Aurelius Valerius Maximianus (286), who defeated the Gauls. Diocletian, at the same time, was successful against the Persians in the East, and afterward penetrated to the sources of the Danube, in Germany. He subsequently, in 292, named C. Gelarius, Cæsar, and Maximianus raised Constantius Chlorus to the same dignity. Thus the empire was divided into four parts. Diocletian resigned the imperial dignity at Nicomedia (305), as did Maximianus at Milan at the same time. Diocletian retired to Salona in Dalmatia, where he found happiness in the cultivation of his garden. In the latter part of his reign he was induced to sanction a persecution of the Christians, whom he had long protected.

Diodati, Giovanni, jō-vän'nē dē-ō-dä'tē, Italian Protestant clergyman: b. Lucca about 1576; d. Geneva 3 Oct. 1649. He was for some time professor, first of Hebrew, then of theology, in Geneva, and in 1619 represented the Genevan clergy at the Synod of Dort, and aided in drawing up the Belgic confession of faith. He is most celebrated for a translation of the Bible into Italian, which is superior to his translation of it into French.

Diodon, dī'ō-dŏn, a genus of teleostean fish, family *Gymnodontes,* order *Plectognathi,* deriving their name from the fact that the ivory-clad terminations of the jaws show no suture, and the fish thus appear to possess but two teeth. The body, as in other members of the family, can be inflated with air till the creature floats on the surface of the water under side uppermost; it is likewise covered with ossifications in the skin, each with a pair of lateral roots and a stiff, movable, erectile spine. The rotundity of these fish when distended has earned for them the name of globe-fish, or prickly globe-fish, in addition to the designations porcupine-fish and sea-hedgehog, suggested by the numerous spines. The four species of *Diodon* are found in all the seas between the tropics, and range to the Cape of Good Hope. The largest species (*D. hystrix*) attains the length of two feet six inches. The food of *Diodon* consists of crustaceans and seaweeds, for the trituration of which its jaws are admirably adapted. This genus has by some naturalists been made the type of a family *Diodontidæ.*

Diod'orus (surnamed SICULUS), Greek historian: b. Agyrium, Sicily; fl. second half of 1st century. In order to render his history as complete and exact as possible, he traveled through a great part of Europe and Asia. It

is very much to be regretted that the greater part of this history, which the author called the 'Historical Library,' in the composition of which he combined the ornaments of rhetoric with the detail of facts, after the example of Theopompus and Ephorus, and on which he had bestowed the labor of 30 years, has not reached our times. It consisted of 40 books, and comprised the history of almost all nations. It is written in the style of annals, and the events are narrated in a confused and discordant manner; but the work is valuable as containing a great mass of materials collected from a number of writers whose works have perished. Only the books 1 to 5 and 11 to 20, and a number of fragments, are now extant.

Diœcious, dī-ē'shŭs, in botany, a term applied to unisexual plants, such as the willow and the hemp, in which the staminiferous and pistilliferous flowers are on separate individuals. In zoology, a term applied to those animals in which the sexes are distinct; that is, those in which the ovum is produced by one individual (female) and the spermatozoid by another (male). It is opposed to monœcious.

Diog'enes of Apollonia, Greek philosopher: b. Apollonia, Crete, fl. in the 5th century B.C. Very little is known of his life. His philosophical speculations were developed in his work 'On Nature,' still extant in the 6th century, but of which we have at present only fragments, preserved in the works of Aristotle, Diogenes Laertius, and Simplicius. His great object was to find the first principle of the world, out of which all things were evolved. Like his master Anaximenes, he came to the conclusion that this great first principle was air.

Diogenes Laer'tius, Greek philosopher: b. Laerte, Cilicia, toward the close of the 2d century A.D. His chief work is 'Lives, Doctrines, and Apothegms of those who have distinguished themselves in Philosophy.' The book is full of absurd and improbable anecdotes, and characterized by much confusion and careless mistakes, yet as containing a mine of information regarding the private life of the Greeks, and many fragments of works now lost, it is of considerable value. It was long the foundation of most modern histories of philosophy, and has preserved the names and doctrines of numerous writers, of whom but for it little would have been known.

Diogenes of Sino'pe, the most famous of the Cynic philosophers, was born about 412 B.C., in Sinope, a city of Pontus in Asia. Having been banished from his native place with his father, who had been accused of coining false money, he went to Athens, and requested Antisthenes to admit him among his disciples. That philosopher in vain attempted to repel the importunate supplicant, even by blows, but finally granted his request. Diogenes devoted himself, with the greatest diligence, to the lessons of his master, whose doctrines he extended still further. At the same time he applied, in its fullest extent, his principle of divesting himself of all superfluities. He taught that a wise man, in order to be happy, must endeavor to preserve himself independent of fortune, of men, and of himself: in order to do this, he must despise riches, power, honor, arts, and sciences, and all the enjoyments of life. He endeavored to exhibit, in his own person, a model of Cynic virtue. For this purpose he subjected himself to the severest trials, and disregarded all the forms of polite society. He often struggled to overcome his appetite, or satisfied it with the coarsest food; practised the most rigid temperance, even at feasts, in the midst of the greatest abundance, and did not even consider it beneath his dignity to ask alms. By day he walked through the streets of Athens baretoot, without any coat, with a long beard, a stick in his hand, and a wallet on his shoulders; by night he slept in a tub, though this last has been doubted. He defied the inclemency of the weather, and bore the scoffs and insults of the people with the greatest equanimity. Seeing a boy draw water with his hand, he threw away his wooden goblet as an unnecessary utensil. He never spared the follies of men, but openly and loudly inveighed against vice and corruption, attacking them with satire and irony. The people, and even the higher classes, heard him with pleasure, and tried their wit upon him. When he made them feel his superiority, they often had recourse to abuse, by which, however, he was little moved. On a voyage to the island of Ægina he fell into the hands of pirates, who sold him as a slave to the Corinthian Xeniades in Crete. The latter emancipated him and entrusted him with the education of his children. In summer he lived at Corinth, and in winter at Athens. It was at the former place that Alexander found him on the roadside basking in the sun, and astonished at the indifference with which the ragged beggar regarded him, entered into conversation with him, and finally gave him permission to ask for a boon. "I ask nothing," answered the philosopher, "but that thou wouldst get out of my sunshine." Surprised at this proof of content, the king is said to have exclaimed: "Were I not Alexander, I would be Diogenes." At another time he was carrying a lantern through the streets of Athens in the daytime: on being asked what he was looking for, he answered, "I am seeking a man." Thinking he had found in the Spartans the greatest capacity for becoming such men as he wished, he said, "Men I have found nowhere; but children, at least, I have seen at Lacedæmon." We are told that Socrates once remarked to him, "I see your vanity through the holes of your coat"; but chronology will not admit of the truth of this anecdote. No doubt many of the anecdotes told of this singular man are fiction. He died 323 B.C., at a great age. When he felt death approaching, he seated himself on the road leading to Olympia, where he died with philosophical calmness, in the presence of a great number of people, who were collected around him.

Diogne'tus, Epistle to, a defense of the beliefs and the religious and social usages of the Christians, written in the 1st century by one who appears to have been himself a disciple of the apostles, but of whose name and history nothing is known. He refutes the false and malicious accusations brought against his brethren — as that in their assemblies they were wont to practise abominable immoralities, that they were atheists, enemies of all government, etc. He writes with the simplicity and candor of one who has nothing to conceal or to explain away; who rather pities the ignorance of the persecutors than reproaches them for their cruelties

and injustices. "The Christians," he writes, "live in their fatherland, but like wayfarers in a strange land; citizens themselves, they share with their stranger brethren; they calmly bear all adversities; they find a fatherland everywhere: but their earthly fatherland is an exile. They marry, like others, but unlike others they do not expose their babes. They live in the flesh, but not according to the lusts of the flesh. They are dwellers on earth, but their true home is heaven. They obey the laws and by their mode of life rise superior to all law. They love all mankind, and all men persecute them. They are delivered up to death and death is for them deliverance."

Di'omede Islands, a group of three small islands in Bering Strait, and midway between Asia and America. They were discovered by Bering in the early part of the 18th century.

Diomedea, dī-ŏm-ę-dē'ą, a genus of birds, including the various species of albatross (q.v.).

Diome'des, king of Argos. He was one of the heroes at the siege of Troy, the son of Tydeus. His daring courage rendered him one of the most distinguished heroes, and, according to the testimony of Nestor, superior to all his contemporaries. Protected by Pallas, he not only encountered the most valiant of the enemies, many of whom he killed, but even ventured to attack the immortals. He was equally distinguished in the council. He boldly opposed the proposal of Agamemnon to leave the plains of Troy without having gained the object of the expedition, and prevailed; he even adhered to his opinion after Achilles had rejected the proffered reconciliation. By carrying off the horses of Rhœsus from the enemies' tents he fulfilled one of the conditions on which alone Troy could be conquered. With Ulysses he removed Philoctetes, who had the arrows of Hercules, from Lemnos, which was another condition of the fall of Troy. Finally, he was one of the heroes who were concealed in the wooden horse by whom the capture of Troy was at length accomplished.

Diomedes, Villa of. See POMPEII.

Di'on Cassius, Greek historian: b. Nicæa, Bithynia, about 155 A.D.; d. there after 230 A.D. He went to Rome about 180; was appointed successively to many high offices; was twice consul; and wrote, in Greek, the 'History of Rome,' from the arrival of Æneas in Italy to 229 A.D. The portions of Dion's work now extant fill five volumes.

Dion Chrys'ostom. See CHRYSOSTOM, DION.

Dion of Syracuse, in Greek history, a connection by marriage of the elder and the younger Dionysius, tyrants of Syracuse, over whom he long exercised great influence. He attempted to reform the younger Dionysius, but his enemies succeeded in effecting his banishment. He afterward returned and made himself ruler of the city, but became unpopular, and in 353 B.C. was assassinated.

Dionæa (dī-ō-nē'ą) **Muscip'ula** ("Venus' fly-trap"), a plant of the sundew family (*Droseraceæ*), found in sandy bogs near the coast of the Carolinas. Audubon reported specimens of enormous size as growing also in Florida. It is a common plant in hothouses. It exhibits in a remarkable degree the irritability common to some plants. There are three hairs upon each division of the leaf, which are so sensitive that an insect alighting upon one of them causes the two sides of the leaf suddenly to come together with considerable force, the strong bristles of the marginal fringe crossing each other like the teeth of a steel-trap, so as to retain the intruder, whose struggles to escape only increase the pressure of the leaf-trap. The insect is retained until its soft parts are digested and absorbed by the plants, after which the leaf opens and the hard parts drop out. This operation requires about 14 days, but if the insect exciting the leaf is not caught, the leaf opens again after an hour or two. The leaf does not retain its vigor for any length of time, gradually becoming inert and drying up. Consult: Darwin, 'Insectivorous Plants.'

Dio'ne, in Greek mythology, the mother of Aphrodite (Venus).

Dionysia, dī-ō-nish'ą, festivals in honor of Dionysus, or Bacchus, which, originating in Egypt, were introduced into Greece by Melampus, 1415 B.C. They were four in number, the Rural or lesser Dionysia, which was the most ancient, the Lenæa, the Anthesteria, and the Dionysia proper, all of which were celebrated annually, with much extravagant merriment, though they were not disgraced by the excesses of the Roman Bacchanalia.

Dionysius, Saint, elected pope in the year 259. He is supposed to have been a native of Greece, but the exact date of his birth is not known. He died 26 Dec. 269, having reigned as pontiff 10 years. Prior to his election as pope he was held in high repute by the theologians of his day, as history states that Dionysius of Alexandria sent him a most important letter on baptism; and later he was the chief theologian in a synod (262) where the principal question had reference to the Trinity. His able commentaries convinced many who had held views different from those taught by the Church.

Dionysius, Saint, "OF ALEXANDRIA": b. Alexandria in the last years of the 2d century; d. there 265 A.D. His family were noble, wealthy, and pagans. Early in his life his philosophical studies turned his attention to Christian writings, and they so influenced his mind, especially the epistles of St. Paul, that he left the pagan schools and became a pupil of Origen. About the year 232 he was ordained a priest, and given charge of the Alexandrian school of theology. In 248 he was consecrated bishop. Shortly after he became bishop of Alexandria the persecution of Decius began, and Dionysius was among the first arrested, and sentenced to be tortured and beheaded. He was rescued by a band of peasants, and for more than a year remained concealed in the Libyan desert. In 257, during the persecution under Valerian, he was again exiled from Alexandria. The writings of Dionysius were numerous, but many have been destroyed. His works were chiefly controversial, or attacks on the heresies of his day. Consult: Butler, 'Lives of Saints'; the English translation, 'Ante-Nicene Fathers.'

Dionysius the Areopagite, converted to Christianity by St. Paul (Acts xvii. 34), during the apostle's visit to Athens. Dionysius is called the Areopagite because he was a member of the high court of Athens, the *Areopagus*, which held its sessions on Mars Hill. It was generally believed by the early historians that this Diony-

sius was ordained a priest, was made bishop of Athens, and ended his life by martyrdom. The New Testament tells us only that he "did believe" and adhered to St. Paul. He has been wrongfully credited with being the author of certain ancient writings on subjects chiefly mystical which, though attributed to that member of the court of Areopagus who was converted to Christianity by the preaching of the Apostle Paul, Acts xvii. 34, must be referred to some unknown writer of the 4th or the 5th century hence the author is now usually styled Pseudo-Dionysius, or Dionysius Pseudo-Areopagite. The titles of the works attributed to the Areopagite, and which seem to have been his writings, are 'The Heavenly Hierarchy'; 'The Ecclesiastical Hierarchy,' 'Divine Names,' 'Mystical Divinity.' Ten letters are attributed to him, purporting to be addressed to St. John the Evangelist, Titus, Polycarp, and others, their contemporaries. These writings came first into notice in 533 at Constantinople when certain Monophysite heretics presented them in confirmation of their doctrines: but they were repudiated by the orthodox as manifestly spurious. Nevertheless before long they came into high favor both in the East and the West and throughout the Middle Ages were received by the most eminent schoolmen as indispensable monuments of the teaching and belief of the early Church. Mgr. Darboy says: "There is scarcely a passage in the writings of Pseudo-Dionysius that has not been quoted by Thomas Aquinas."

Dionysius the Elder, Syracusan tyrant: d. 367 B.C. He contrived to make himself master of the citadel of Syracuse, together with all the arms and provisions contained in it, and finally to declare himself tyrant, at the age of 25 years. After having finished a short war against the Carthaginians he made preparations for a great war against Carthage. He attacked the Carthaginians at once by land and water, and gained a complete victory, which was soon followed by an advantageous peace. In 368 he commenced a new war against the Carthaginians, intending to drive them entirely out of Sicily. He did not, however, succeed in this attempt, and was obliged to conclude a disadvantageous peace. He holds the unenviable place in ancient history as the representative tyrant. He lived in continual dread of assassination, of which the sword of Damocles has become the symbol. He had the state prison so constructed that even the solitary murmurings of its inmates could be heard by him, and it was hence called the Ear of Dionysius.

Dionysius the Younger, Syracusan tyrant. He succeeded his father, Dionysius the Elder. Dion his kinsman directed his attention to the doctrines of Plato, representing to him that this great philosopher alone was able to teach him the art of government, and the means of rendering his subjects happy. In consequence of this advice Dionysius invited Plato to his court. The latter succeeded in tempting him into the path of virtue and knowledge, and in giving a new character to his whole court. An opposite party, however, awakened the king's suspicions against Dion, and caused his banishment. Dion subsequently made himself master of Syracuse, to which Dionysius did not return until after the murder of Dion. The rule of Dionysius now became so oppressive that Timoleon appeared with a fleet before Syracuse, and expelled the tyrant. Dionysius was carried to Corinth, where he is said to have gained a scanty living by giving lessons in grammar.

Dionysius, Ear of. See EAR OF DIONYSIUS.

Dionysius Exig'uus, an eminent scholar of the 6th century. He it was who introduced the now existing method of calculating the Christian era. He was a monk and, according to his close friend Cassiodorus, was of Scythian origin (*natione Scytha*). His surname Exiguus (little) was perhaps self-assumed by him out of humility, for lowly mindedness is one of the virtues enumerated by Cassiodorus in his eulogy of his friend; but the surname may have had reference to his stature. His reputation was high as a theologian and as one intimately conversant with the Scriptures and with the ordinances of the Church. He is author of a collection of ecclesiastical constitutions and canons which is still extant. Many writings of ancient Greek authors have been saved for us in the translations made of them into Latin by Dionysius.

Dionysius of Halicarnassus, Greek critic, historian, and rhetorician: b. about 50 B.C.; d. 7 B.C. He came to Rome about 29 B.C., and lived there on terms of intimacy with many distinguished contemporaries till his death. His most valuable work is his Greek 'Archæologia,' a history of Rome down to 264 B.C. Of the original 20 books, we possess only the first nine in a complete form. He was a greater rhetorician and critic than historian, and his extant works on oratory, on the criticism in detail of the great Greek orators, on the characteristics of poets and historians from the time of Homer to Euripides, and upon Thucydides and Dinarchus, possess great interest and value.

Dionysus, dī-ō-nī'sŭs, the original Greek name of the god of wine, the name Bacchus, by which he was also called by both the Greeks and the Romans, being at first a mere epithet or surname. See BACCHUS.

Diophan'tine Analysis, that branch of algebra which treats of the method of solving certain kinds of indeterminate problems relating principally to square and cube numbers, and rational right-angled triangles. The following are examples: (1) To separate a given square number into two parts, each of which shall be a square number; (2) to find three square numbers which are in arithmetical progression; (3) to find a right-angled triangle whose sides shall be commensurable with each other.

Diophan'tus of Alexandria, Greek mathematician. He flourished, according to some authorities, about the middle of the 4th century, according to others about the end of the 6th. He left 13 books of 'Arithmetical Questions,' of which only six are extant; and a work on 'Polygon Numbers.' See DIOPHANTINE ANALYSIS.

Diopside, dī-ŏp'sid, a variety of the mineral pyroxene occurring in monoclinic prisms. It is a silicate of calcium and magnesium, having the formula, $Ca\,Mg\,(SiO_3)_2$. Iron is occasionally present in considerable amount, replacing the magnesium, and it then graduates towards hedenbergite. It has a hardness of

about 6, and a specific gravity of about 3.3. It is usually pale green to nearly colorless and when transparent yields gems of considerable beauty. The finest gems come from Dekalb, New York, where it occurs in transparent crystals varying from colorless to a deep, rich green. Ala, Piedmont, is another celebrated locality.

Dioptase, dī-ŏp'tās, a rare, beautiful and highly prized mineral, occurring in prismatic crystals of rich emerald-green color and vitreous lustre. Its inferior hardness, 5, greater specific gravity, about 3.3, the terminal rhombohedrons on its crystals, and its reactions for copper, easily distinguish this so-called "emerald-copper" from the true emerald. It is found sparingly near Clifton and near Riverside in Arizona, also in the French Congo, Chile and Hungary, but the finest specimens are from Russia.

Diop'trics (from Gr. *dia,* through, *op,* see), the science which treats of the refraction of the rays of light, when the rays pass through different refracting mediums — for instance, from the air, through the lenses of a telescope. Dioptrics, consequently, is a branch of optics. It demonstrates the different directions in which the rays move, according as they are broken on plane or curved surfaces. The principles deduced from these observations determine the nature of the various lenses, explain the manner in which the light is refracted in the human eye, teach the manner of making telescopes, microscopes, etc. The ancients were not acquainted with this science. Natural science in modern times has been greatly indebted to it. By its aid the human eye has been enabled to reach objects previously unknown. Kepler, Snellius of Leyden, Descartes, Newton, etc., not only extended this science, but founded a great part of their discoveries on it. In modern times, science has been enriched by the invention of the achromatic telescope. See LENS; OPTICS; REFRACTION; TELESCOPE.

Diora'ma, a method of reproducing landscape scenery, invented or perfected by M. Daguerre, and first exhibited by him in 1823. The particular advantage which this method possesses is, that it causes the light to play over the picture with an intensity graduated at will. The illusion is heightened by the transparencies, through which light is poured from behind the picture. The principle of the diorama has been successfully applied in producing some of the prettiest scenic effects of the modern stage.

Diorite, dī'ō-rīt, a rock consisting essentially of hornblende, biotite mica, and plagioclase felspar that have a granitoid, or completely crystalline, texture. According to variations in composition, there are augite-diorites which grade into gabbros and quartz-diorites which grade into granites. The hornblende and augite-diorites are dark-colored; the quartz-diorites, light-colored. As augite changes readily to hornblende, many so-called diorites may represent altered diabases and gabbros; by further metamorphism the hornblende changes to chlorite. Diorites under shearing stresses may be changed into hornblende and chlorite schists. Andesites and dacites are rocks of the diorite family, but having a porphyritic texture. As compared with the syenites, diorites contain less potash and soda but more lime and magnesia, hence the principal felspar is soda-lime. True diorites are rare in the United States, though quartz-mica diorites and augite-diorites are not uncommon, and grano-diorites — the intermediate stages between diorite and granite — occur in great masses in the Sierra Nevada, in California. True diorites occur in various places abroad. One from Wales contains: SiO_2 61.75; Al_2O_3 18.88; Fe_2O_3 0.52; FeO 3.52; Cal. 3.54; MgO 1.90; Na_2O 3.67; K_2O 1.24; and has a specific gravity of 2.79.

Dioscoreaceæ, dī-ŏs-kō-rē-ā'sę-ē, a natural order of monocotyledenous plants, with alternate reticulate-veined leaves, tuberous rootstocks, and twining stems. The flowers are small and unisexual. There are nine genera, with about 175 species, chiefly inhabiting tropical America and South Africa. The typical genus is *Dioscorea,* which includes the yam of commerce (*D. sativa*). The best-known species in eastern America is the wild yam-root (*D. villosol*), which is found in moist thickets from Rhode Island north, south to Florida, and west to Texas. It ascends to 4,000 feet in the Virginia Mountains. The flowers are of a greenish-yellow bloom in June and July, and the fruit, which adheres to the vine until late in the winter, is ripe in September. *Tamus* (*Testudinaria*) *elephantines,* a South African species, sometimes called elephant's foot, and Hottentot's bread, has a large fleshy rhizome, with a rough cracked bark, which is used as food by the Hottentots in times of scarcity.

Dioscorides, dī-ŏs-kŏr'ī-dēz, Peda'nius, physician: b. Anazarbus (Cæsarea Augusta), in Cilicia, in the 1st century A.D. He was author of a celebrated work on materia medica, in five books. It is particularly valuable in regard to botany, as most of the medicines which the author mentions are taken from the vegetable kingdom. Two other works are also attributed to him — the 'Alexipharmaca,' which was united with the 'Materia Medica,' forming the three last books of it, and treating of the poisons in the three kingdoms of nature, and their antidotes; and the 'Euporista,' which treats of remedies that are easily procured. The best edition of Dioscorides is that of Sprengel (1829-30).

Dioscuri, di-ŏs-kū'rī, the classical name for Castor and Pollux, twin brothers, and tutelary deities of wrestlers, horsemen, and navigators. Their transplantation to the sky as one of the 12 constellations of the zodiac (the Twins) is a celebrated allegory of mythology. They are sometimes styled Tyndaridæ, because Tyndarus was the nominal father of both.

Dioscu'rus, or Dioscorus, patriarch of Alexandria, immediate successor (444) of St. Cyril, was a supporter of the heresiarch Eutyches (q.v.). Pope Leo and Flavianus, patriarch of Constantinople, having condemned the teachings of Eutyches, Dioscurus procured from the Emperor Theodosius II. the convocation of a council of bishops at Ephesus in 449. To this council Pope Leo sent three legates as his representatives. Dioscurus was present, surrounded by a host of his satellites, and with their aid prevented the legates from presiding in the council and even from reading to the bishops the letters addressed to the assembly by Leo. Flavianus was so roughly handled by the rabble that he died shortly after in consequence of the injuries he received. The council thereafter got the title of Latrocinium (Brigandage) from the

Latins, and of Συνοδος Ληστρικη from the Greeks (robbers' synod), but Theodosius upheld its decisions, and Dioscurus procured the appointment of one of his partisans, Anatolius, to succeed Flavianus in the see of Constantinople. After the death of Theodosius another council assembled at Chalcedon in 451, which annulled the decrees of the Latrocinium of Ephesus and decreed the deposition of Eutyches from his offices as presbyter and archimandrite.

Diosma, a genus of plants belonging to the rue family (*Rutaceæ*). They are small shrubs with white or red flowers; leaves alternate or opposite, simple. They are remarkable for their overpowering and penetrating odor, arising from the presence of a yellowish volatile oil. They are the buchu plants of the Cape of Good Hope. The plant has been employed in chronic affections of the bladder and urinary organs in general, and has also been administered in cholera.

Dios'pyros, a genus of plants belonging to the ebony family (*Ebenaceæ*). There are about 100 species, most abundant in Asia. They consist of trees and shrubs with white or pale yellow flowers. *D. lotos* is the Indian date-plum, and is supposed by some to be the lotus of the ancients. The trees of several of the species furnish ebony wood. The fruit of *D. kaki* is occasionally brought from China as a dry sweetmeat. *D. virginiana*, the American representative of the family, is the persimmon (q.v.).

Dip, in geology, the angle of inclination of any stratified rock to the horizontal of its bedding planes. In the same way the cleavage planes of any metamorphic rock are said to dip and a thin intrusion of igneous rock, a dike, has a dip. Also the contact plane of an igneous and a sedimentary rock may have a well-defined dip. The direction of the dip is the line of highest inclination and is expressed by compass bearing; thus a bed may dip 63° N., 35° E. The angle of dip is determined by an instrument known as a clinometer. Initial dip is the name given to the slight inclination away from the land that sedimentary beds have as a whole when laid down in the sea. Such initial dips are often of importance in determining flexures when the sediments are subsequently subjected to mountain-building pressures. See Fault; Fold; Geology; Mountain.

Diphthe'ria (Gr. *diphthera*, a skin, piece of leather, extended in meaning to comprise membrane), a contagious and (in its severe forms) malignant disease, caused by a specific bacillus, and generally characterized by the formation of a fibrinous false membrane in the throat. Although previously observed, it was first clearly described in 1826 by M. Bretonneau of Tours under the name of "diphtherite," as a form of very fatal sore throat occurring chiefly in children. It is now known that most cases of membranous croup are identical with diphtheria. The membranous inflammations of the throat occurring sometimes in scarlet fever and other infections fevers may or may not be true diphtheria, a bacteriological examination being usually necessary to determine this point.

The period of incubation is usually from two to seven days. The disease begins by malaise, feeling of chilliness, loss of appetite, headache and more or less fever; soon the throat feels hot and painful and the neck is stiff and tender. If seen early, the throat is red and swollen, but a false membrane of yellowish or grayish color quickly appears in spreading patches, usually first on the tonsils, whence it often spreads to the pillars of the fauces, uvula and back of the throat, and may even extend down the œsophagus or gullet; extension of the membrane into the nasal cavities is a grave symptom. There is usually enlargement of the glands at the angle of the jaw, and albuminuria generally occurs at some stage of the disease. Diphtheritic membrane may be formed on any mucous surface, or even on a wound; if it extends into the larynx it gives rise to cough and difficulty in breathing. The throat affection is often accompanied by a low and very dangerous form of fever, with quick, feeble pulse and great and rapid loss of the patient's strength, which is still further reduced by the inability to take food; in other cases, the disease is fatal by paralysis of the heart or by suffocation, due to invasion of the larynx. Invasion of the larynx may necessitate intubation or tracheotomy. After the acute disease is over, the recovery may be delayed by paralytic symptoms of various kinds; or simply by extreme debility with exhaustion and loss of appetite. In the early stages of convalescence there is danger of sudden heart failure upon exertion.

Diphtheria is contagious. It may occur as a complication of scarlet fever, measles, and other infectious diseases. All gradations in the intensity of the disease from mild sore throat to septic and gangrenous forms occur. Damp and temperate climates seem to favor its development. Insanitary conditions favor its occurrence, but the disease may appear under the most favorable hygienic surroundings. An important mode of its spread is by school children, either infected in a mild form or coming from households where the disease exists. One attack affords little or no protection against recurrence. In the treatment of the disease the patient should be isolated and all clothing and other articles which have been in contact with the sick, as well as the discharges, should be disinfected. Local applications to the diseased parts and means to maintain the strength of the patient were the most valuable therapeutic measures before the introduction of the antitoxin treatment.

True diphtheria is now known to be caused by a specific bacillus called *Bacillus diphtheriæ*, or the Klebs-Löffler bacillus. This bacillus was first recognized by Klebs in 1883 by microscopical examination of diphtheritic membranes, but it was first successfully cultivated by Löffler in 1884. Its causal relation to the disease was not thoroughly established till the investigations of Roux and Yersin in 1888, who demonstrated the existence of a peculiar and intensely poisonous substance known as the diphtheria toxin. It is now generally admitted that the Klebs-Löffler bacillus is the cause of true diphtheria. The diphtheria bacillus is a slender rod characterized especially by irregularities in shape and staining with aniline dyes. It grows best at about the temperature of the human body, and all growth ceases below 20° C. It can be cultivated artificially on various media, but best on a mixture of blood serum and beef-broth rendered solid by heating. In a moist condition the bacilli are killed in a few minutes by a temperature of 60° C. They survive for months in a dried condi-

tion. Exposure to the direct rays of the sun kills the bacilli in a short time. Guinea-pigs, when inoculated beneath the skin with a small quantity of a pure culture of the virulent diphtheria bacillus, die within two to five days with characteristic changes in the body. Skilled bacteriologists can recognize the presence of diphtheria bacilli in the throat by microscopical examination and the appearances in the cultures within 24 hours or less, but their complete identification may require the inoculation of a guinea-pig. Both in human beings and in animals the bacilli grow only or mainly locally in the false membrane, the severe constitutional symptoms being due to the absorption of a powerful poison secreted by the bacilli.

The ways in which diphtheria bacilli may be conveyed from sick to healthy persons are almost countless. In ordinary breathing the expired breath contains no germs, but in speaking and especially in coughing, a fine spray is emitted which may contain the bacilli and thus convey the disease. All sorts of articles, such as handkerchiefs, toys, drinking utensils, furniture, clothing, bed-linen, and the like, may become contaminated with the bacilli and be the means of spreading the disease. The specific germs have been found in the hair, on the shoes, and elsewhere on the persons of those brought into frequent and close proximity to the patient. Direct contact with the patient, as in kissing, may communicate the disease. It is especially through direct or mediate contact with infected individuals that the disease is spread. Hence, preventive measures, consisting in isolation of the patient till the bacilli have disappeared from the throat, and in thorough disinfection, are of the first importance in checking the spread of diphtheria. Insanitary conditions, formerly thought to be the direct cause of diphtheria, are now regarded only as accessory causes in affording opportunities for the prolonged survival of the specific germs or in weakening the powers of resistance of the individual.

The discovery of the diphtheria bacillus has led to the introduction of a new and most successful method of treatment of the disease, known as serum-therapy or the antitoxin treatment. The establishment of the principles and the introduction of this treatment are due especially to Behring of Germany and Roux in Paris. The underlying principle of the treatment is based on the fact that, if a susceptible animal is inoculated first with small and then with increasing doses of the toxin produced by the bacillus, the blood of the animal is found to contain a substance called antitoxin, which has the power of neutralizing or rendering harmless the toxin. In order to obtain large quantities of the healing serum a horse is generally selected for the process of immunization. By proper methods very powerful antitoxins can be obtained. The antitoxin is used not only to cure the disease, but also to render persons insusceptible for a time to the disease. This latter procedure of preventive inoculation has been found especially useful in preventing extensive outbreaks in children's hospitals and asylums after the introduction of one or more cases of diphtheria. Dr. William H. Welch, of the Johns Hopkins University, in 1895, in an analysis of over 7,000 cases of diphtheria treated by antitoxin found that the fatality was reduced by this treatment by over 50 per cent of the previous death-rates; he concluded that the antitoxin serum is a specific curative agent for diphtheria, surpassing in its efficacy all other known methods of treatment for this disease. Since his report, this conclusion has been confirmed and even more favorable results have been obtained.

Some idea of the great benefits which have been derived from the discoveries outlined above may be had by comparing the death rate before and after the serum therapy became the practice. For the five years immediately preceding the discovery and use of antitoxin in the city of Berlin the death rate for diphtheria in every 10,000 inhabitants was 10.2 per cent, and for the next five years it fell to 3.7 per cent; in Paris, 6.5 per cent before antitoxin, and 1.3 per cent afterward; in New York 14.5 per cent before, and 6.3 per cent after antitoxin. So safe is the use of antitoxin, it is now advised that every child exposed should receive an immunizing dose, as that confers protection.

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Diph'thong, two vowel sounds, following one another so closely as to form but one syllable, as in out, where the sound is really composed of a and u. Many double vowels in English are not real diphthongs, there being only one sound heard, whereas some single vowels have a diphthongal sound. The only real English diphthongs are i as in high; i as in aye; oi in boil; ow in how; and ew in mew.

Diple'gia. See Paralysis.

Diploblas'tica. See Embryology.

Diplococ'cus. See Bacteria.

Diplodocus, dĭ-plŏd'ō-kŭs, a saurian-footed, herbivorous dinosaur found in the American Jurassic deposits. The length of skull of this species was about 21 inches, of brain about 3 inches, and of body 50 feet. The animal is supposed to have been a hippopotamus-like wader, and to have lived on vegetation in the water.

Diplo'ma (Gr. *diploō,* "fold" or "double"), originally a document on two tablets of wax (see Diptych), or on writing material which was folded. The Roman emperors granted diplomas to couriers, giving them the use of public servants and horses; hence diploma came to signify a writing or document conferring some power, authority, privilege, or honor, usually under seal and signed by a duly authorized official. Diplomas are given to graduates of a university on their taking their degrees; to clergymen who are licensed to officiate; to physicians, civil engineers, etc., authorizing them to practice their professions.

Diplo'macy, simplified, means political negotiation. Commonly applied the term refers to international relations and the adjustment of differences between nations. The principle objects of diplomacy have always been and are to-day to preserve the independence, rights and security of state and nation. Under diplomacy has been preserved the European "balance of power," the prevention of general wars and the securing of commercial advantages under treaty regulations. As a matter of fact all treaties are the result of diplomacy. In the past there have been many international and other conventions or congresses of diplomats, to preserve the peace

of the world and to settle differences of international moment. Such was the congress of Westphalia held in 1648, to settle the issues involved in the Thirty Years' War; the Congress of Vienna (1814-15); and the more recent Hague conference (1899) held at the instance of the Czar of Russia, for the promotion of the peaceful settlement of international differences among civilized nations. In the various countries, under modern methods and conditions, the usual instruments of diplomacy are: (1) the secretaries of state for foreign affairs; (2) regular diplomatic agents or representatives of various grade ranging from ambassadors to *chargés d'affaires* or consular agents; (3) special embassies and diplomatic agents or representatives appointed for the accomplishment of a particular purpose, as the case of the Alaskan Boundary Commission at London (1903). Prior to the 15th century diplomats were of the last named class. See AMERICAN DIPLOMACY; INTERNATIONAL LAW; UNITED STATES — DIPLOMACY OF THE.

Diplomat'ics, Diplomatic, the science of deciphering ancient MSS., inscriptions, etc. See PALÆOGRAPHY.

Diplopia, dĭ-plō'pĭ-ạ, an affection of the sight in which objects are seen double. It arises from derangement of the visual axis.

Diplop'terus, a genus of fossil ganoid fishes, of four species, belonging to the Old Red Sandstone.

Diploz'oon, a parasitic trematode worm which infests the gills of the bream, and which appears to be formed of two distinct bodies united in the middle, and resembling an × or St. Andrew's cross, two sexually mature individuals being thus united. The larva, formerly called *Diporpa*, swims about in the water for a time, but ultimately settles in the gills of a fish, where it remains during the rest of its existence. The larvæ then unite in pairs by the attachment of the ventral sucker of one individual to a knob on the back of another.

Dip'noi, one of the primary subdivisions of fishes, characterized by the presence of membrane or covering bones on the skull, the absence of secondary bony jaws (maxillary, premaxillary, and dentary bones), and the direct articulation of the lower jaw with the skull. The *Dipnoi* were early predominant in geological times, many and varied forms occurring as fossils in the Middle and Upper Palæozoic strata. Some of these, forming the order *Arthrodira*, are of doubtful relationship, and are classed with the *Dipnoi* only provisionally. The best-known representatives of this group have the anterior region of the body enclosed in continuous bony plates, with a complex articulation between the head and trunk. In the Devonian of Ohio are found giant forms, like *Dinichthys* and *Macropetalichthys*, from 10 to 25 feet long, and with sharp-beaked jaws like a turtle's. Numerous other *Dipnoi*, more closely resembling the still living ones, have been found as fossils in various parts of the world. At the present time the group is decadent, and but three genera and as many species, each found in a restricted area in widely separated regions of the earth, remain. They are, *Protopterus* from Africa, *Lepidosiren* from South America, and *Ceratodus* from Australia. On account of the lung-like structure of the swim-bladder and its function as an organ of respiration, they are known as lung-fishes. Being the earliest vertebrates which are believed to have breathed air, the *Dipnoi* have an exceptional interest, and many zoologists consider them to have been the original stock from which the *Amphibia* and all other terrestrial vertebrates arose. Consult: Dean, 'Fishes, Living and Fossil.'

Dippel, Johann Conrad, yō'hän kōn'räd dĭp'pĕl, German mystic and alchemist: b. Frankenstein, near Darmstadt, 10 Aug. 1673; d. Berleburg, Prussia, 25 April 1734. He led a wandering life for many years, involved in difficulties political and theological, and he finally wrote a tract which appears to have ruined him with all parties, and to have provoked replies in the same spirit as that in which the attack had been made. He now fell in with some alchemical books, and at once threw himself into the search for the philosopher's stone. In this also he was assisted by others, who hoped to profit by the discovery, but when no result was obtained, and the money was not forthcoming, Dippel retired to Berlin, where he induced some persons of rank and wealth to help in the search. During his residence here he produced what is known as Dippel's Oil (q.v.), from which followed indirectly that of Prussian blue — an accidental discovery, it is true, but one of a class that could hardly have been made but for the constant and multifarious, though not well-directed labors, of such men as Dippel.

Dip'pel's Oil, the black fetid oil which was formerly produced by the distillation of stag's horn or ivory, and was used medicinally. Dippel, in the 17th century, refined it by washing with lime or potash, and rectifying the oil until it became limpid and aromatic. This rectified oil was the *oleum animale Dippelii* of the older pharmacopœias, which was prescribed in doses of a few drops as an antispasmodic and diaphoretic, and as a hypnotic.

Dipper, a name given to the seven stars in the constellation of the Great Bear, from their being arranged in the form of a dipper, or ladle.

Dipper, a water-ousel. See OUZEL.

Dipping-needle, or **Inclination Compass,** an instrument for measuring the magnetic dip or inclination; that is, the angle which a magnetized needle, free to move in the plane of the magnetic meridian, and about a horizontal axis, makes with the horizontal plane at the place. The dipping-needle is a light magnetized steel bar supported on a horizontal axis which passes, as nearly as possible, through the centre of inertia of the bar. The axis is either a steel knife-edge which rests on agate plates, or a fine wire supported by friction-rollers. A vertical circle surrounds the needle, the axis on which the needle turns being at the centre; the circle is graduated, and the needle moving over the graduations, the inclination to the horizon can be read off by means of it. The vertical circle is mounted on a vertical pillar, which turns round its own axis; and to the pillar there is attached at the foot an arm or pointer, which moves over a horizontal graduated circle. This last is supported on three legs furnished with leveling screws.

To observe with the dipping-needle the vertical circle must be placed in the plane of the magnetic meridian, and then the angle at which the needle is inclined must be read off by means of the graduations on the circle. The plane of the magnetic meridian might, of course, be determined by means of a separate instrument, such as the declination compass (q.v.). But this is not necessary, the vertical pillar and horizontal circle described above furnishing all that is required. A complete observation is made in the following way. The instrument having been properly leveled, the vertical circle is turned round on the pillar till the needle points vertically downward. When this is the case we know that the needle must be moving in the vertical plane at right angles to the plane of the magnetic meridian, because it is only in this plane that there is no horizontal component of force acting on the needle. The vertical circle is now turned round on the pillar through 90 degrees, which is done exactly by means of the horizontal circle at the foot. The needle is thus free to move in the plane of the magnetic meridian, and the inclination is read off.

Corrections for defects in the instrument must be applied in order to make the determination exact. In the first place, in order to correct for any error in centering of the axis on which the needle turns, readings are taken at both ends of the needle. Next, because the magnetic axis of the needle may not coincide with the axis of the figure, the needle is turned over on its bearings, and fresh readings are taken. Thirdly, the axis on which the needle turns may not pass exactly through the centre of inertia of the needle. If this were the case the needle would not balance about the axis exactly, one or other end of it being the heavier. To do away with error from this source, after one set of readings have been taken, the needle is lifted from its bearings and remagnetized, the end that was formerly north being now made the south end. A complete new set of readings is taken. The mean of all these gives the true inclination. See DECLINATION NEEDLE; MAGNETISM, TERRESTRIAL.

Diprotodon, dī-prō'tō-dŏn, a huge extinct marsupial of the Pleistocene Period in Australia. Its nearest living relatives are the wombats and kangaroos, which it somewhat resembled in the character of the head. The animal was by far the largest of the marsupials, almost equaling a small elephant in size, and resembling the elephants in its rather long legs and short post-like feet. The structure of the foot-bones is very remarkable; the great toe is short and stout, the others reduced to small slender rudiments. Its remains have been found in great abundance in certain dried-up salt lakes (Lake Callibona, etc.) of the central Australian deserts.

Dip'sacus, the typical genus of the *Dipsaceæ*. See TEASEL.

Dip'sas, a genus of tropical opisthoglyph serpents, mostly tree-snakes with greatly elongated bodies and protective coloration, which are usually nocturnal, and feed mainly upon lizards and birds and their eggs, though some species pursue mammals and other birds exclusively. Their posterior poison-fangs (see OPISTHOGLYPHA) are large, but they differ in venomous ability, which is rarely deadly to a large animal. This and several allied genera form the colubrid sub-family Dipsadinæ.

Dipsoma'nia. See ALCOHOLISM.

Dipsosaurus, dĭp-sō-sâ'rŭs, a reptilian genus of the family *Iguanidæ* (plurodont lizards), whose habitat is confined to the warmer parts of the United States. The genus contains but one species, *D. dorsalis,* which is terrestrial in its habits. When alarmed, it raises its head and tail and glides swiftly to its burrow in the sand.

Dip'tera, an order of two-winged insects, of which the common housefly and bluebottle are familiar examples. They are characterized by a body with slight coriaceous coverings, a trunk open beneath, and containing a sucker composed of two, four, or six lancet-shaped elongated scales, two palpi, antennæ almost always composed of three joints, large eyes, an abdomen of four to seven distinct segments, tarsi with five joints, and two short clubbed appendages called *halteres* or balancers, which seem to be the rudiments of the posterior pair in four-winged insects, and are kept in continual motion. They all undergo a complete metamorphosis. They are found in the earth, the air, and the water, in all climates and in all localities. The far greater number live exclusively on the sap of flowers.

Diptera'ceæ, or **Dipterocarpeæ,** an important order of exogenous trees. They are found in India, and especially in the eastern islands of the Indian archipelago. There are about 8 genera and 48 species known. The trees belonging to this order are handsome and ornamental, and abound in resinous juice. When young, the *Dryobalanops camphora* yields, on incision, a pale yellow liquid, consisting of resin, and a volatile oil having a camphoraceous odor; when old, it furnishes a kind of crystalline camphor. Other species produce fragrant resins used in temples, also varnishes; while some of the commonest produce pitches, and valuable timber.

Dip'terus, a fossil fish occurring in the Devonian rocks, and belonging to the Dipnoi sub-class, family *Dipteridæ,* of which this is the typical genus. Its distinguishing character is the possession of double dorsal and caudal fins. An interesting fact connected with it is that it approaches nearer to the lung-fishes than do any of the present existing ganoids.

Diptych, dĭp'tĭk, a tablet consisting of two leaves, light boards, held together by a hinge. In the time of the Roman empire diptychs were much used in correspondence between friends; even when three boards or more were used the name diptych (*Sintoxos,* folded double) was generally retained instead of triptych, tesseraptych, etc. Diptychs figure largely in the history of the Church for several centuries, being tokens of intercommunion between the assemblies of the faithful throughout the world. The use of diptychs in the liturgical service was in full vogue in the middle of the 4th century and it must have commenced much earlier. It was continued in the Latin Church to the 12th century and in the Greek Church to the 15th. The Diptychs of the Living had inscribed on them the names of the pope, patriarchs, bishops then living and presiding over the faithful in their respective spheres; also the names of the clergy of the particular churches in which they were

kept; names also of benefactors of the churches, of the emperor, and the empress, etc. For all these the faithful offered their prayers. The Diptychs of the Dead contained usually the names which had once been written in the Diptychs of the Living. In the diptychs were also inscribed the names of the Virgin Mary, martyrs, and other saints. If any name, whether of the living or the dead, was erased from the diptychs it signified that the person was regarded as out of the communion of the Church. The diptychs both of the living and dead were read from the *ambo* or pulpit to the congregation. Church calendars and martyrologies seem to have had their origin in the diptychs. In the Roman Missal, the marks of the diptychs are very evident. At the prayer, "Te igitur," the names of the reigning pope and the bishop of the diocese are mentioned. In other prayers of the Mass the diptychs are followed. Consult: Kraus, 'Real — Encyclopadie'; Benedict XIV., 'De Missa.'

Dipus. See JERBOA.

Dique, dēk, Canal del, Colombia, an "artificial arm" of the Magdalena River in the department of Bolivar. It is navigable by steamers, and is a means of communication between Cartagena and the interior of the republic. Its total length is about 74½ miles, and in its course it passes through several swamps and receives the waters of various conduits, reaching the coast south of Cartagena.

Diræ, dī'rē, or Eumenides. See FURIES.

Dirce, dėr'sē, in Greek legend, the second wife of Lycus, king of Thebes, who from jealousy imprisoned Antiope, whom Lycus had divorced in order to marry herself; but Jupiter set Antiope at liberty, when she soon gave birth to two sons, Amphion and Zethus. These latter having grown up, put Lycus to death, and attached Dirce to the tail of a wild bull, which dragged her over the rocks, on which she was dashed to pieces. The gods, pitying her misfortunes, changed her into a spring, which bears her name and flows near Thebes.

Dircks, Henry, English civil engineer: b. Liverpool 26 Aug. 1800; d. Brighton 17 Sept. 1873. He published: 'History of the Search for Self Motive Power' (1861); 'The Ghost as Produced in the Spectre Drama' (1863); etc.

Direct and Retrograde, terms which, when used in astronomy, have reference to the real or apparent motion of the planets. When the planet moves forward or appears so to move, from west to east, in accordance with the order of signs in the zodiac, the motion is said to be direct. When the motion appears contrary it is said to be retrograde.

Direct Legislation. See REFERENDUM.

Direct Taxes, those which in theory the bearer cannot transfer to others, by adding correspondent charges to goods or service; as distinguished from indirect, those on goods for sale, which will be added to their selling price. The former in current understanding include taxes on polls, property, incomes, and privileges — that is, fees and licenses for doing business, keeping pets, carriages, etc. But the Supreme Court of the United States, in the income-tax cases, decided that only taxes on polls and property are direct; which is law for this country. The theory at best does not quite conform to facts. Taxes on real estate occupied by the owner, for example, are not transferable; but those on property for rent are so much added rent charge, and as indirect as customs duties. The heavy license fees charged by many municipalities for doing certain classes of business are *pro tanto* an increase of the business expense, and must be met in the charges if the business is to live; often, indeed, they are used openly as "protective," to give industries of one State an advantage over others — this is especially so with insurance companies. On the other hand, income taxes on salaries cannot in practice be transferred, as an employer will not raise salaries on account of his employees' taxes; while those on mercantile incomes are in the same category as those on licenses, and can to some extent be recouped from customers. All State and municipal revenues in the United States are raised from direct taxes in the broader sense; the Constitution prohibits them from laying duties on exports or imports, but not on internal manufactures, which, however, are also left entirely to the general government. The latter restricts itself to customs and excises. Only five times in its history has it resorted to direct taxation, in the narrower sense above: in 1798, 1813, 1815, and 1816, on real estate and slaves; and in August 1861 a levy of $20,000,000 for war expenses was laid on all house lots with dwellings and improvements. The operation of the act was suspended 1 July 1862, when $15,000,000 had been collected; and the act of 2 March 1891 refunded it to the States.

Directors, the persons authorized to manage and direct the affairs and business of a corporation or company. The directors are sometimes called managers or trustees, in accordance with the purpose and nature for which the corporation or company was formed. At the present time, nearly if not all, corporations are formed under general laws and it depends on the law under which the corporation is created as to the number of directors and their qualifications. The general qualification is that all directors must be stockholders in the corporation or, if it has no stock, they must be members of the corporation. The directors are generally elected by the stockholders, and some States have passed laws allowing cumulative voting, by which each stockholder may multiply the number of his shares by the number of directors to be elected, and cast all his votes for one director or distribute them in any manner he desires. It has been held that this kind of a law is unconstitutional, if applied to corporations created before the law was passed; as it impairs the obligation of the contract. It may be valid, if applied only to corporations created after the passage of the act. In some cases directors are appointed. The directors must act as a body and not as individuals. A majority of the board of directors is necessary to a legal meeting and if that number is present a majority of those present will be sufficient to perform any act. When there is a quorum present, all acts performed are presumed to be done in the regular course of business. The directors for the purpose of the business of the corporation are held to be the corporation itself; and their powers and duties depend on the laws under which the corporation is formed and the charter and by-laws

of the corporation. Notice to the board of directors during a meeting of any matter in which they are required to act is notice to the corporation.

The directors are considered as general agents of the corporation, and they are the only ones that can manage the business of the corporation; although the directors are generally elected by the stockholders they are responsible to the corporation and through the corporation to the stockholders. As the directors derive their power from the charter their acts are of no effect if they are outside of the delegated power; and all acts performed by the directors which are outside of their power must be passed upon by the stockholders.

While directors are sometimes called trustees, they are not held to the same strict accountability as an ordinary and regular trustee; although their position is a fiduciary one. The directors may deal with the corporation the same as any other individual; but they cannot use their position for any special benefit to themselves. They may even go so far as to buy up the indebtedness of the corporation and at a sale buy in and acquire the absolute title to the corporate property. The directors may delegate their power to an agent, as a private individual may do, and the agent's power is not impliedly revoked by a change of the members of the board, as the act of appointment is not that of the directors individually but of the board. The directors have a discretionary power and when it is honestly exercised there is no one that can make them account for their acts. A frequent illustration of this power is in relation to suit by or against the corporation, as to whether they shall be brought or defended. If a director's individual interests are in conflict with the interests of the corporation the act must be fair and just to the corporation.

Directory, a compilation of the names and addresses of the persons in a city, or in a special line of trade, or the like. The first directory of the city of London was issued in 1677, under the title 'A Collection of the Names of Merchants,' and the first New York directory in 1786, the latter containing less than 1,000 names. The London directory of 1732 is believed to be the first which bore the title "directory." Every American city of moderate size now has its directory, and many directories of towns and counties are issued. There are also a few State directories, and a great number of business directories, arranged according to the needs of the respective localities. Directories of firms in each of the leading lines of trade are issued regularly, often in connection with some sort of commercial rating. Directories of people in society are commonly termed blue books. Telephone companies also issue directories of their subscribers.

City directories constitute the most important class of these publications, and are commonly issued by private enterprise. The concern that issues the first directory of a town or city, and continues to issue the same at regular intervals, usually yearly, soon establishes a sort of franchise, which enables them to control that field as long as they issue a satisfactory book. There are a number of firms in the United States whose sole business is publishing directories, and they have acquired territory by being the first in their respective fields. As a rule they do not compete with each other in the same territory, for even in very large cities a second directory rarely pays.

The gathering of names and addresses for a directory, when rightly done, is an expensive matter, involving a house-to-house canvass of the entire territory, within a short space of time. Sometimes the work is cheapened by the copying of assessors' lists or lists of voters, but the great majority of directory publishers find that the best way is to make their own canvasses yearly. To protect themselves against the competition of firms that might simply copy the book and thus compete with them at a much reduced cost, all experienced directory publishers now insert a number of bogus names and addresses in their books, which are copyrighted. While a competitor would have a right to issue another correct, and therefore very similar, book without infringing the copyright, the fact that he copies these bogus names is direct evidence of infringement, calculated to result in a judgment of damages to the injured party.

The mere placing of names in alphabetical order for a directory seems a simple matter, yet in reality it involves considerable care and judgment. Take the names "McNeil" and "MacNeil" for instance. If they are separated, a person searching in the directory under one spelling might miss the other altogether. As it is generally understood that "Mc" is simply an abbreviation of "Mac," the directories now commonly begin the lists of M's with the "Mcs," which ever way they are spelled, allowing such names as "Madison" and "Magee" to appear farther on. The location of such names as begin with figures also calls for discretion, as when it is desired to insert "1st Ward Republican Club." Such an entry is usually put in the f's, even if "1st" is the authorized way of spelling it.

The profit in directories is mainly in the advertising, and few of them would be issued simply for the sake of the sale. The number of firms that buy them is naturally limited to successful business concerns whose business requires frequent reference to a directory. Drug stores habitually carry copies on their counters for the benefit of the public, and many banks and newspaper offices have copies in their offices placed conveniently for the use of customers.

The advertising in the directory of a large city commands a high price, and yields large returns. It is customary to place the advertising on the margins of the leaves of the directory, and almost all over the cover, as well as the edges of the book. No available spot is considered sacred from such intrusion, as is the case with most newspapers and magazines. Any man or firm that will pay for it can have his or their name inserted in as big type as desired, or secure conspicuousness in any other way that ingenuity can suggest.

At the present time the directory field of industry in the United States appears to be rather crowded, and many directories are published not for immediate profit, but simply to hold a field until it shall grow large enough to be profitable. A few years since an association of directory publishers was formed, which holds annual meetings, and endeavors to check unwise competition, and to conserve the interests of the trade as a whole.

Directory, in French history, the executive body established by the constitution of the French republic in 1795. (Fr. *directoire*.) This body consisted of five members, called directors (*directeurs*) who were chosen by the Council of Elders from candidates presented by the Council of Five Hundred. Each director was president for three months in rotation, and one was compelled to make room for a new member every year. The unpopularity of the directory's home policy was increased in 1799 by the disastrous results of its war policy, and it was easily overthrown by the *coup d'état* of Napoleon and his brother Lucien, 9 Nov. 1799. See FRANCE.

Direc'trix (Lat. *linea directrix*, "a directing line"), in mathematics, a line governing the direction of another line. If a point so move that its distance from a given fixed point is to its perpendicular distance from a fixed straight line in a constant ratio, it describes a conic section, of which the fixed straight line is termed the directrix, and the fixed point the focus. The constant ratio referred to is termed the eccentricity, and its magnitude determines the nature of the conic. Thus, if in the figure AB be the directrix and F the focus, if the point P move so that its distance from F is to its distance PM from AB in a constant ratio, then P will trace out a conic section, which will be an ellipse, parabola, or hyperbola, according as the ratio in question is less than, equal to, or greater than unity — that is, as FP is less than, equal to, or greater than PM, or FV than VI. A quadric surface has a directrix with analogous relations. The fixed lines on which rests the line whose motion, right or curved, generates a surface, are called directrices, or directing lines.



Dirhem, dēr'am, or **Dramm**, a modification of the Greek *drachma*, the name under the caliphs for a weight of silver equivalent to about 45 grains, and was also used for precious stones and medicine in Arabia, Persia, Egypt, and Turkey. As a coin the value varied, but may be given at 11 cents under the caliphs. In Turkey, the name dirhem has lately been given to the much smaller weight, the French gramme.

Dirk, a kind of dagger formerly carried sheathed between skin and stocking as a weapon by the Highlanders of Scotland. Dirks are worn by midshipmen and cadets of the British navy. See DAGGER.

Dirk-Hartog (dērk-här'tŏg) **Island**, an island on the west coast of western Australia, at one of the entrances to Shark Bay, which it partly encloses; area, about 450 square miles. It forms a plateau with good pastures and plenty of water. The pearl oyster and edible oysters are here in great abundance.

Dirschau, dēr'show, Prussia, city, about 19 miles southeast of Danzig, on the Vistula. The city has railroad and machine shops, and large sugar works. Pop. 12,000.

Dirt-eating. See GEOPHAGY.

Dis (also **Orcus** and **Tartarus**), in Roman mythology the name given to Pluto, the Greek god of the lower regions. The word *dis* is akin to *dīvus*, and originally denoted merely godhead.

Disability, in law, when absolute disables the party from holding public office or doing any legal act, and is usually the result of murder, outlawry, or any outrage upon person or property. Aliens, infirm and aged persons, dependent on public charity, are under this ban of incapacity, and in most Catholic countries those individuals who have been excommunicated. There is a disability termed partial that covers infancy, minority, lunacy, and drunkenness. Also a term in accident insurance policies which, on account of inability to work or perform natural duties resultant from injuries, provides payment for the afflicted party. See ATTAINDER.

Disassociation. See DISSOCIATION.

Disbar'ment, the expulsion of an attorney, counselor, or advocate from practice at the bar, this act depriving him of the privileges of his profession. A lawyer suffers this penalty if adjudged guilty of any misconduct of grave nature, as gross contempt of court, bribery, etc. The courts alone have this power of dealing with a man. Before disbarring him the accused is given every opportunity to refute the charge, being allowed to defend himself in open court. A lawyer so dealt with may, at the discretion of the authorities, be restored when sufficient proof is brought them that there is no likelihood of a future offense.

Discharge, in architecture, the relieving part of a wall, or a beam or other piece of timber, from the superincumbent weight by means of an arch thrown over it. In hydraulics, the issuing direction of water from a reaction or turbine wheel; as the outward discharge, or Fourneyron turbine; the vertical discharge, or Jonval turbine; the centre discharge, etc. In bankruptcy, a writing or document certifying that a bankrupt has satisfactorily passed the necessary forms, and is thereby discharged from all further responsibility for the debts contracted by him previous to his bankruptcy. In the military and naval services, a document given to each soldier or sailor on his dismissal from or quitting the service, in which are detailed full particulars as to his length of service, conduct, reason for discharge, etc. In electricity it signifies the removal of the charge by communication between the positive and negative surfaces or poles, or with the earth.

In dyeing, a substance such as chloride of lime or nitric acid, used by calico-printers to remove a color. Suppose a white pattern is to be produced on a uniformly colored ground. The cloth is first dyed, and then the pattern is printed with an acid, such as the tartaric, thickened with gum. When passed through a dilute solution of bleaching-powder, the acid decomposes it, and the liberated chlorine destroys the color at the parts where the pattern was printed. Sometimes the cloth is prepared at the same time for subsequent pigment printing.

Disciple, literally, one who learns anything from another; and hence, the followers of any teacher, philosopher, or head of a sect. In this sense the word is sometimes used in Scripture, as when we read of the disciples of Moses, of John, of Christ. Generally, however, it is used with reference to the last of these — the followers of Jesus. Sometimes all who re-

ceived the doctrines of Christ are called disciples, but in a more limited sense, it is applied to the 70, or 72, persons who were his more immediate followers and attendants. Sometimes it is used as synonymous with apostle, and is applied to the Twelve.

Disciples of Christ. The religious movement, whose representatives have come to be known as Disciples of Christ, or Christians, may be said to date its origin from the 'Declaration and Address' issued by Thomas Campbell, September 1809, and endorsed by his son, Alexander Campbell, who later became the leader of the movement. Thomas Campbell migrated from the northern part of Ireland in 1807, to seek a home for himself and his family in the New World. He located near Washington in western Pennsylvania. He was related by blood to the poet, Thomas Campbell, and was a man of learning and profound piety. Being a minister in the Seceders' branch of the Presbyterian Church, he entered upon his labors in connection with that denomination immediately upon his arrival in this country. His experiences in seeking to assemble the scattered people of God of different names and creeds, and to instruct them in spiritual things, led him to realize more fully the evils of divisions among Christians. In his efforts to promote greater unity and cooperation among the members of these different sects, he found himself in conflict with the ecclesiastical authority under which he was working and was brought to trial before his presbytery, which censured him for his course. Mr. Campbell soon withdrew from the ecclesiastical authority under which he had been preaching, but continued his ministry to an increasing number of people in private dwellings and wherever else an audience could be gathered.

In the 'Declaration and Address' referred to it was declared that "the Church of Christ upon earth is essentially, intentionally, and constitutionally one, consisting of all those in every place that profess their faith in Christ and obedience to Him in all things according to the Scriptures, and that manifest the same by their temper and conduct; and of none else, as none else can be truly and properly called Christians." While admitting the necessity of "distinct societies, locally separate one from another," this new declaration of independence declared that "there ought to be no schisms, no uncharitable divisions among them. They ought to receive each other as Jesus Christ also received them, to the glory of God, and for this purpose they ought all to walk by the same rule; to mind and speak the same things, and to be perfectly joined together in the same mind and in the same judgment." The address adds that "in order to do this, nothing ought to be inculcated upon Christians as articles of faith, nor required of them as terms of communion, but what is expressly taught and enjoined upon them in the Word of God. Nor ought anything to be admitted as of divine obligation in their church constitution and management but what is expressly enjoined by the authority of our Lord Jesus Christ and his apostles upon the New Testament Church, either in express terms or by an approved precedent."

In a word, the new movement had for its aim no less an object than the unity of Christians as they were one in the apostolic Church. In order to realize this consummation in harmony with the Lord's intercessory prayer they decided to reject all party names for those given in the New Testament, and all human creeds or formulas as authoritative or binding on the human conscience, or as bases of fellowship, and to take the word of God alone as their rule of faith and practice, and especially the New Testament, which was given for the guidance and instruction of Christians in their new life in Christ. Believing it to be necessary to return to the original foundation and practice of the Church in order to realize its unity and its power, they made a fresh study of the New Testament to ascertain (1) what was the essential creed or confession of faith required in the early Church; (2) on what conditions persons were received into its membership; and (3) what was the nature of their organization and government. They reached the conclusion that the confession of faith made by Simon Peter, on which Jesus declared he would build his Church, namely "Thou art the Christ the Son of the living God," was the creed of Christianity and the essential faith, and that all those who would make this confession from the heart, being penitent of their past sins, were to be admitted by baptism into the membership of the Church; that baptism in the early Church consisted of the burial of a penitent believer in water in the name of the Father, and of the Son, and of the Holy Spirit, and that only such were fit subjects for baptism; that the form of Church government was congregational; that each congregation had its deacons and elders or bishops, the former to look after the temporal, and the latter the spiritual interests of the Church. The Lord's Supper, it was found, was observed at first daily perhaps, but later weekly, on the first day of the week, in remembrance of Christ's suffering and death. Hence they practice weekly communion.

With this plea for the New Testament basis of fellowship, and a return to the original purity and simplicity of the gospel and Church organization, the Disciples have made a marvelously rapid increase. The movement at present has reached a numerical strength of 1,250,000, having its colleges, its religious journals, and its missionary, educational, and benevolent organizations, all of which are doing effective work. The American Christian Missionary Society is the national organization for home missions. The Foreign Christian Missionary Society, as its name indicates, has for its object the evangelization of the world. Besides this the Christian Woman's Board of Missions is an organization of the Christian women, which is doing mission work in both the home and foreign fields.

The Disciples of Christ raised over $600,000 for missionary purposes in 1902, while contributing a grand total of over $6,000,000 for all religious purposes in that year. They are supporting missions in India, China, Japan, Africa, the Philippines, Cuba, Porto Rico, Mexico, Scandinavia, and Turkey. Their aim is to be evangelical without being sectarian, and to be liberal without being latitudinarian. They attribute their success to their advocacy of Christian union, the simplicity and directness of their preaching and the freedom which they enjoy, untrammeled by human creeds or by any hierarchical authority.

The following statistics are taken from the annual official report for 1902:

	1902	
Number Churches	10,957	
Number Communicants	1,207,377	
Number Sunday Schools (Sunday Schools)	8,271	
Number Officers and Teachers	796,699	
Number Ministers	6,477	
MISSIONARY.		
American Christian Missionary Society	$178,324	
Christian Woman's Board of Missions	139,034	
American Christian Missionary Society	82,931	
Board of Church Extension	54,866	
State and District Missions	154,059	
Miscellaneous Missions	15,000	$ 624,214
EDUCATION AND BENEVOLENCE.		
Buildings and Endowments of Schools	$175,000	
Homes for Orphans, the Aged, etc.	72,332	
Ministerial Relief	7,421	$ 254,753
LOCAL CHURCH WORK.		
Ministerial Support	$3,065,000	
Incidental Church Expenses	760,000	
Church Buildings	550,000	
Church and Bible School Literature	340,000	$5,315,000
Total from all sources		$6,193,967

J. H. Garrison,
Editor The Christian-Evangelist.

Disciples of Christ. See Christ, Disciples of.

Discipli'na Arca'ni, the modern name of an ancient usage of the Christian Church in withholding from pagans, and even from catechumens during their preparation for admission to baptism, the knowledge of certain of the Church's doctrines. The existence of this rule of silence in the Church in the 4th century is shown by the Catecheses of St. Cyril (q.v.) of Jerusalem, where the lectures on the sacrament of the Eucharist are deferred till after the catechumen had been baptized. He was then made acquainted with the *catechesis mystagogica,* or mystic catechism. Sometimes in that age when the sacred mysteries had to be referred to in a mixed assembly of believers and pagans, or in writings addressed to pagans, the fathers would use forms of speech quite unintelligible to the uninitiated, adding, "the believers will understand." On one occasion St. Epiphanius alluded to the sacramental words of institution of the Eucharist, "This is my body" in this cryptic fashion, saying instead of τοῦτό ἐστιν τὸ σῶμά μου, τοῦτό μού ἐστι τόδε. And St. John Chrysostom writing to Pope Innocentius about the profanation of the Sacrament on a certain occasion, writes plainly: "The most holy blood of Christ was spilled upon the clothes of those soldiers." But Palladius, in his life of Chrysostom, uses a cryptic form of language to denote the same occurrence; his words are: "They spilled the *symbola.*" St. Paul is quoted as enjoining a like reticence where he writes to the Corinthians that he fed them with milk, not with strong meat, because they were not able to bear it. Testimonies of the ancient fathers concerning the existence in their times of the *disciplina arcani* are numerous and, says Newman, "that it existed even as a rule with respect to the Sacraments, seems to be confessed on all hands."

Discipline, in military and naval affairs, the general term applied to the prescription and enforcement of statutes, rules of procedure, orders, and regulations governing officers and men in service. Regimental discipline is chiefly maintained by the adjutant. He inspects and tells off all guards, escorts, and parties; keeps the regimental books; receives all garrison orders; superintends the drill and field movements, etc. In matters of discipline the adjutant-general is to the whole army what the adjutant is to a regiment.

Discipline, Books of, two books connected with the Scottish Church. The First Book of Discipline was drawn up by John Knox and four other ministers, and laid before the General Assembly in 1560. It was also submitted to the privy council; and though not formally ratified by them, it was subscribed by the greater part of the members. A similar document, called the 'Second Book of Discipline,' was prepared and sanctioned by the General Assembly of 1578; and from that time it has been recognized as the authorized standard of the Church of Scotland in respect of government and discipline. It lays down principles regarding the relations of Church and state; defines the provinces, duties, and relations of church-officers, the mode of their election, etc., and states the operation of the Presbyterian polity in the General Assembly, synods, and presbyteries of the Church of Scotland.

Discipline, Ecclesiastical, the control and correction which ecclesiastical bodies claim the right to exercise and administer for the purpose of maintaining correctness of living, and soundness of belief among their members. The only form of discipline at present exercised over contumacious lay members of a religious body consists of excommunication, or exclusion from a share in the ministrations and offices of the Church. The clergy, on the other hand, are liable to suspension or deposition; the former a temporary, the latter a perpetual, deprivation of office and authority. For methods by which the civil power was authorized by the Church during the Middle Ages to discipline heretics or notorious evil doers, see Inquisition.

Disclaimer, in equity, a plea put in on the part of a defendant in which he disclaimed all right or title to the matter in demand by the plaintiff's bill. In patent law, disclaimer is the renunciation or relinquishment of all claim to patent rights in an invention. The term is also applied to the refusal to accept a gift or devise of land or other property, and generally to the waiving of any claim.

Dis'co, an island on the west coast of Greenland, under the parallel of 70° N. It is mountainous, reaching a height of 3,000 feet; about 90 miles in length; and contains much excellent coal. The harbor of Godhavn is on the south coast.

Discob'oli, Cuvier's name for the lumpsuckers (*Cyclopterus*), beside which he placed the *Remora* (q.v.). The term is still used for the family to which the lumpsucker (q.v.) belongs.

Discob'olus, (1) in classical antiquity, a thrower of a discus, or quoit; a quoit-player; specifically, the name given to the famous Greek statue of the quoit-thrower, preserved among the Townley Marbles in the British Museum. (See Discus). (2) In ichthyology a name given by Cuvier to his third family of soft-finned teleostean fishes, having the ventral fins under the

pectoral. The name is derived from the ventral fins forming a disk on the under surface of the body, by which the fishes are enabled to catch hold on the points of rocks.

Dis"comedu'sæ. See JELLYFISH.

Discoph'ora. See LEECH.

Discord (Latin *discors*, inharmonious), in music, is a combination of sounds producing irregular vibrations and technically called cacophony. It is a direct violation of harmonic laws and frequently spoken of as nothing but downright noise. Often confused with dissonance (q.v.) which, however disagreeable the effect it has upon a hearer, obeys certain grammatical rules in the science of music, though never consonant. Celebrated composers have used discords purposely in their compositions requiring *macabre* character. Berlioz in his 'Damnation of Faust' is a case in point, while Wagner's scores bristle with cacophonies and dissonances.

Discount (O. F. *discontes*, to count off), a deduction made from a quoted price, in consideration of a cash payment. Discount is also the amount deducted from the face value of a bill of exchange or promissory note, as the price for cashing it to the payee so many months or weeks before it is payable by the person who is primarily responsible for its payment. Bank discount is simple interest on the face value of a promissory note, and deducted from the face value, instead of being reckoned on the amount advanced. True discount is such an amount deducted, as would be simple interest on the amount advanced, for the time specified in the note.

Discoveries of America to 1542, Spanish and Portuguese: John Fiske writes: "Properly regarded, the discovery of America was not a single event, but a very gradual process. It was not like a case of special creation, for it was a case of evolution, and the voyage of 1492 was simply the most decisive and epoch-marking incident in that evolution."

Half of a century was occupied in the principal Spanish and Portuguese discoveries which, being followed by colonization, gave to those nations their vast possessions in the western hemisphere. In 1492 Columbus landed on Watling Island, which the natives called Guanahani, and which he named San Salvador, 12 October (see BAHAMAS); discovered Cuba 28 October; Hispaniola, now called Haiti or Santo Domingo, 6 December; thought Haiti must be Japan, and Cuba the Asiatic mainland; deserted by Martin Pinzon with the Pinta, and his flagship the Santa Maria having been wrecked, he returned to Spain in the Niña, arriving at Palos 15 March 1493. In 1493, seven weeks after the return of Columbus, Pope Alexander VI. assigned undiscovered lands, etc., west of a certain line to Spain, and east of the same line to Portugal (see DEMARCATION, LINE OF); on 25 September Columbus sailed from Cadiz, his second voyage bringing him in sight of the island of Dominica, 3 November; Guadaloupe and Marie Galente were discovered 4 November; Antigua 10 November; Porto Rico later in November, and the town of Isabela was founded on the northern shore of Hispaniola in December. The ruins of Isabela, the first town established by Europeans in America, are to be seen about 25 miles west of Puerto Plata. In 1494 Columbus discovered Jamaica, 3 May; the Isle of Pines 13 June. In 1497 Vicente Yañez Pinzon, Solis, Amerigo Vespucci, and others sailed from Cadiz, 10 May; probably their first landfall was the coast of Honduras, whence they followed the coast of Mexico and the United States, rounding Florida, and proceeding up the Atlantic coast to "the finest harbor in the world," conjectured to be the Chesapeake Bay; returning to Spain by way of the Bermudas, and reaching home 15 Oct. 1498. In 1498 the third expedition of Columbus started on 30 May from the Spanish port of San Lucas de Barrameda; discovered Trinidad 31 July; Columbus caught a glimpse of the land at the delta of the Orinoco, and called it Isla Santa, or Holy Island, 1 August, but after passing the mouth of the Orinoco reasoned that so vast a stream of running water could be produced only upon a continent; went westward to Cubagua. In 1499 Vespucci, with Ojeda and La Cosa, followed the northern coast of South America for a long distance, seeing a part of the coast of Brazil, the Guianas, and Venezuela, and proceeding west of Cubagua as far as the Gulf of Maracaibo and Cape de la Vela. In 1500 Vicente Yañez Pinzon (who had sailed for Spain in December 1499) struck the Brazilian coast near the site of Pernambuco, 20 January, and discovered the Amazon 26 January; Diego de Lepe, between January and June, followed the Brazilian coast to latitude 10° S. approximately: Cabral landed on the Brazilian coast, which he explored from about 12° to 16° 30′ S., taking possession in the name of the king of Portugal (see BRAZIL); Bastidas, La Cosa, Balboa, and others (see CENTRAL AMERICA), sailing in October, explored westward from Cape de la Vela to the Gulf of Urabá, and beyond that to Puerto Bello on the Isthmus, the voyage ending September 1502; Gaspar and Miguel Cortereal made voyages to Labrador in the interests of Portugal (1500–1–2), but the coasts visited were mainly within the region previously explored by the Cabots. In 1501 Vespucci sailed for the Brazilian coast, 14 May, his voyage ending 7 Sept. 1502; he explored the Atlantic coast of South America from 5° S. to 34° S., and sailed thence to South Georgia Island, 54° S. In 1502 Columbus set out on his fourth voyage, 11 May; discovered Martinique 13 June; during the latter part of that year and the earlier part of 1503 he carefully studied the coast between the gulfs of Honduras and Darien, especially that of the narrowest part of the Isthmus (see CENTRAL AMERICA). In 1503 and 1504 Coelho and Vespucci sailed along the coast of Brazil, the former to about 40° S., the latter to about 23° S.; Jaques explored the Brazilian and Patagonian coasts to about 52° S. In 1505 and 1507 Vespucci, La Cosa, and others explored the Atrato River and the Darien region. In 1508 Cuba was circumnavigated by Ocampo, and thus first known to be an island; during a voyage extending from 29 June 1508 to October 1509, Solis and Pinzon explored the Brazilian coast to about 40° S. In 1512 and the following years explorations of the interior of Colombia, etc. (see DABAIBA), were undertaken in the hope of finding an Eldorado. In 1513 Balboa (q.v.) discovered the Pacific; Ponce de Leon in March discovered some of the Bahamas, and on Easter Sunday, 8 April, landed on the coast of

Florida. In 1516 Solis, searching for a strait at La Plata River, was killed by the natives. In 1517 Cordova explored the coasts of Yucatan. In 1518 Grijalva explored the Mexican coast, etc. In 1519 Cortes discovered and began conquest of the Mexican uplands of the interior. In 1520 Magellan discovered the straits which bear his name, 21 October; entered the southern Pacific Ocean 28 November. In 1524 the first (unsuccessful) expedition sailed from Panama bound for Peru. In 1527 Narvaez led an expedition to the upper Gulf of California. In 1531–33 a part of the empire of the Incas (see CUZCO, PERU) was explored and conquered by Francisco Pizarro and others. In 1535 Grijalva discovered California; Diego de Almagro led a force into Chile, but was compelled to withdraw. In 1540 Pedro de Valdivia set out from Peru to succeed where Almagro had failed. In 1541 Francisco de Orellana descended the Amazon from Peru. In 1542 Gonzalo Pizarro returned to Quito from the exploration of the heart of the South American continent; and about the same time De Soto died in the Mississippi valley, having discovered the great river of the North American continent.

MARRION WILCOX,
Authority on Latin-America.

Discovery, in law, the act of a litigant who is called on to reveal or make known any matter or document which will aid in enforcing a right or repelling an unjust demand.

Discovery, The, a ship noted in the history of exploration, as the vessel built by the East India Company in 1602 to determine the whereabouts of the northwest passage. She was originally commanded by Capt. George Weymouth, who sailed with a consort from Greenland, 2 May 1602. In 1610 Henry Hudson discovered the Hudson Bay in the same vessel, spending the succeeding winter in the ice. In 1611 the crew mutinied and set Hudson and some of his companions adrift, never again to be heard of. Later she was commanded by Sir Thomas Button (q.v.) who discovered Nelson's River and other points. In 1615 and 1616, the Discovery sailed with Baffin (q.v.) and Bylot, making important discoveries and explorations. In 1875–6 the name was borne by a steam vessel, one of the two in Nares' expedition.

Discovery of America. See AMERICA; NORSEMEN.

Discus, among the Greeks and Romans a quoit of stone or metal, from 10 to 12 inches in diameter, convex on both its sides, sometimes perforated in the middle. The players aimed at no mark, but simply tried to throw the quoit to the greatest possible distance. It was sometimes furnished with a thong of leather to assist in the throwing. The throwing of the discus was a notable feature of the revival of the Olympian Games at Athens in 1896. In these games the discus-throwing event was won by Robert Garrett of Princeton University, who far outclassed all the foreign competitors. The world's record in 1900 was 118 feet 9 inches, held by C. Henneman, an American. See DISCOBOLUS; QUOITS.

Disease, a term which refers to any morbid deviation from normal health — as disease of mind or body — and refers specifically to a group of morbid conditions which may affect the same part of the body and exhibit similar symptoms, such as disease of the lungs, disease of the brain, Bright's disease, that disease of the arteries which causes a hardening of the muscular elastic coat, and which is called arteriosclerosis, disease of the mind (Jastrow). Such a definition posits the knowledge of what is normal, and this is often a very difficult position to understand. Thoma has suggested as an empirical definition of disease a deviation from the normal in its anatomical or chemical structure, or in the functions of the body, its organs and elements of organs, which exceeds the limits of individual physiological variation. This definition, the author himself admits, gives no explanation of the nature of the processes. It does no more than to give the criteria for deciding when any condition is to be called pathological. That is, it may readily be seen that any definition of disease from a general standpoint must necessarily take into consideration what normal physiological variations may be, and it is now acknowledged that no hard and fast lines can be drawn between normal and pathological processes. Barker has well said: "The activities of cells are subject to certain definite laws, which hold in diseased conditions of the body as well as in health. When the structure or function of the organism differs markedly from a normal standard for the species, the reason lies either in abnormality in the inherent activities in some or all of the cells of the body or in the abnormal nature of the environmental influences to which some or all of the cells are exposed, or in both. In any of these cases, morbid instead of normal reactions are encountered. In the first instance, environmental influences, normal for healthy individuals, would call forth morbid reactions; in the second instance, individuals previously healthy would become diseased through environmental influences which are incompatible with the maintenance of health because outside the ordinary deviations from the average; and in the third instance the two conditions would be combined. Properly speaking the science that studies diseased or abnormal conditions is called pathology, but because of the extension of the science it is divided into several departments. Thus one distinguishes general pathology from descriptive pathology. General pathology stands with reference to special pathology in the relationship that philosophy occupies with reference to the individual sciences. It is the synthesis of the forms which special pathology affords. It endeavors to find out the laws that govern disease in general, searches for the causes of disease, discovers the order of events in diseased conditions, and groups the symptoms and lesions common to whole series of special pathological processes. Commonly it is popular to speak of diseases as organic and functional; organic diseases having attached to them definite structural changes in the organs affected; functional diseases being understood as diseases in which no such structural changes are demonstrable. This is a purely artificial distinction, however, and on close analysis cannot be maintained. Diseases are classified in general for purposes of general inquiry, particularly as to the statistical studies for economic purposes such as are involved in tabulation of cases of death, by health boards, for hospital returns, and for medical departments in the army and navy. These classifications are of great importance for the gathering

of much useful information, but they are naturally subject to much change, as new discoveries ally certain heretofore apparently unrelated diseases under common heads. Consult Hektoen, 'American Text-book of Pathology.'

Diseases, Germ Theory of. As a speculation, the germ theory of disease is centuries old; as demonstrable in fact, however, it is a thing of but yesterday. Aristotle in the second century believed that certain diseases were due to microscopical organisms, although he and many others who believed the same could not prove it, but it was reserved for Pasteur, Koch, and other modern students of the young science of bacteriology to demonstrate beyond doubt that certain disease processes result from the invasion of the human body, as well as those of animals and plants, by certain forms of lowly organized plant and animal life, and that the disturbance in the healthy functions of these animals and plants is an indication of the battle taking place between the living animal or plant cells and their animal or plant parasites.

In the early days of the germ theory of disease, it was thought that only plants such as molds and bacteria could give rise to disease, but it has been further demonstrated within recent years that there are a large number of lowly organized animals which might obtain an entrance into the body and there cause disease. Historically it is of interest to note that one of the first diseases definitely proven to be associated with bacteria was a certain disease of silkworms. This was studied by Pasteur, and opened the way to subsequent discoveries of modern bacteriologists, so that at the present time it is clearly proved that such affections as diphtheria, tuberculosis, typhoid fever, pneumonia, cholera, tetanus, anthrax, relapsing fever, influenza, erysipelas, rheumatism, the plague, glanders, and actinomycosis, are due to definite bacteria, while malaria, certain forms of dysentery, certain forms of abscess of the liver, and some skin diseases are known to be caused by low forms of animal life, the protozoa; and still higher in the animal kingdom it is known that certain parasitic worms give rise to definite forms of disease, some of these being known as distomiasis, ascariasis, trichinariasis, uncinariasis, filariasis. In addition to these the ordinary tapeworms may be mentioned. With reference to the bacterial agents that cause disease, in the article on bacteria (q.v.) it was pointed out that there were a great many forms of these plants and that only a few of these were known as pathogenic, or as disease-producing. This term pathogenic, however, is purely a relative one, because under certain circumstances the introduction of well-known pathogenic micro-organisms in the human body may be harmless. In the study of the pathogenic effects of any given bacterium both the micro-organism and the animal host should be taken into consideration, because any resulting disease is a product of some detail of the characters of the infecting agent on the one hand and of the subject of the infection on the other. There may be many modifying circumstances, involving each of these factors. Thus as regards the character of the particular species of bacterium that may enter the body, its effect will depend chiefly upon its inherent virulence, the number that may be introduced into the body at one time, and the path through which the infection takes place. Thus the virulence (meaning largely the power of multiplying) of many micro-organisms in the body varies greatly under different conditions. With reference to the number: The healthy tissues can resist the certain number of pathogenic micro-organisms of given virulence, but if a larger number are introduced it may be that the animal will succumb. This is a fact demonstrated to be true for tuberculosis in high degree. The path of infection is of much importance, for if virulent micro-organisms are thrown directly into the blood-stream, and can thus traverse the entire body looking for a favorable nidus or growth, the chances are much against the organism. With reference to the subject of infection: The species of the animal, his race peculiarities, and his age are all important items. Thus it is known that tuberculosis among the Indians is extremely fatal; whooping-cough, when first introduced into New Zealand, was almost universally fatal; children are susceptible to infectious diseases which the adult escapes; local diminished vitality plays a very important role in the production of disease in many individuals. See IMMUNITY.

As to the modes of bacterial action, two main factors are known to be involved; one concerns the ability of the bacteria to multiply in the animal body after they have once entered, and the other, the production of poisons by them that may act upon the tissues. The former process is known as the infection, the latter as the intoxication. Thus in the discussion of the germ theory of disease, it is understood here that the disease process as seen in the individual is nothing more or less than an evidence of the struggle that takes place between the protective agencies of the body on the one hand and similar self-assertive processes taking place in the bacterial body, for it can hardly be denied that rapid multiplication and the production of poisons are the means employed by bacteria for self-protection. This production of poisons is one of the most interesting features of the study of bacterial diseases, and it is probably true that these poisons, or toxins as they are termed, result both from the breaking down of the nutrient materials on which the bacteria feed, and as a result of their intravital activities. It is probably true that the action of bacteria as disease-producers depends largely upon the chemical products formed directly or indirectly by them, and that this action is shown by certain tissue changes that are produced in the body, local or systemic, and by symptoms of intoxication of varying character. The tissue changes that may be produced by bacteria are so various as to include almost every type of known pathological change. In general, however, they are those of a degenerative or necrotic nature, indicating direct damage, or they are those of a reactive defensive nature on the part of the body of the infected animal, the former indicating the degree of vulnerability, the latter the protective power that the tissues possess. Many of the symptoms occurring in bacterial affections result from the changes just outlined, and it is of importance to note as a special proof of the truth of the position that bacteria may cause disease that nearly all, if not quite all, of the changes found in the organs

of a diseased body, and also the symptoms observed in infective disease, can be experimentally reproduced by the injection of bacterial poisons. Of the precise chemical nature of these poisons very little is known, therefore the general term toxins has been applied to them. It is known, however, that both the living and the dead bacteria contain these intracellular toxins, and therefore dead bacteria under certain circumstances can bring about destructive changes in the human body. It would seem from the recent work of Brieger, Martin, Fraenkel, and others that these bacterial toxins belong to the general group of albumoses, and that their action is analogous in many ways to a number of enzymes. Many of them are allied to well-known animal and vegetable poisons, such as ricin, abrin, and a number of the snake-poisons, particularly those of the rattlesnake and the heloderms. For theories of toxic action, and details regarding protective agencies of the human or other animal body in its struggle with disease-producing micro-organisms, see IMMUNITY. See also ANTITOXINS; DISEASE.

Diseases of Plants. Diseases in plants have existed as long as plants themselves — ages before the advent of man. Civilization and agriculture have usually developed together in all parts of the earth and it is not strange that anything that troubled or destroyed an important food plant should be observed and the cause sought. In the earliest historic records as well as in early Greek and Roman times some of the more destructive diseases of plants, like rust and mildew or blight of cereals were widely known and discussed. A special deity was recognized who ruled these phenomena and to whom sacrifices were offered.

Injury due to animals, especially insects, and to extremes of weather and unfavorable soil conditions were early often associated with their appropriate causes. It was not, however, until the latter part of the 18th and the beginning of the 19th century that the solid foundations of plant pathology were laid by the development of anatomy and physiology. The early works of Unger, 'Die Exantheme der Pflanzen,' etc., (1833); Weigmann, 'Die Krankheiten und Krankhaften Misbildungen der Gewächse' (1830); and of Meyen, 'Pflanzenpathologie' (1841), mark an important step forward in the embryo science of plant pathology. During this period microscopical, chemical, and physiological work with plants was active. The writers of this period rather overworked unfavorable nutrition as the cause of disease. Maladies that could not be traced to visible external causes were usually held to be due to unsuitable nourishment or the lack of something in the soil. It was not believed that the fungi so often found associated with diseases had any causal relation to them. They were held to be abnormal developments of the diseased cells themselves and not independent organisms. It remained for De Bary to determine the true nature and habits of fungi and bacteria and to demonstrate their causal relation to disease in many cases. His careful work gave a great stimulus to investigation in plant and animal pathology and opened what has proved to be the most important field of the science. His two most important works are 'Untersuchungen uber die Brandpilze,' etc. (1853), and 'Morphologie und Physiologie der Pilze,' etc. (1866). Since De Bary the rapid development of the subject is well represented by the works of Hartig (1874–80), Frank (1880–90), Sorauer (1886–8), Marshall Ward (1889–1901). The last work, 'Diseases in Plants,' is one of the most excellent and readable expositions of the subject that has appeared.

Health and Disease Compared.— That there is no defined line between health and disease is generally recognized by pathologists and physiologists. A plant continually varies in response to changes in its environment. There is, however, for each individual and for a given species as a whole a certain accustomed range or power of adaptation to each factor of its environment and to the various combinations of these factors. The process of natural selection operates to perfect this adaptive attuning of the individual and the species as a whole to the conditions under which they live. If these conditions are subject to great extremes of moisture and dryness or heat and cold, the natural or indigenous vegetation will be found, as a rule, equal to the emergency, while an introduced species, if developed under an environment not subject to such extremes, might be seriously injured or destroyed, and if the change is very unusual even the indigenous species may suffer. A moist, warm, cloudy spring may be followed by dry hot weather and the tender watery growth be so much dried out and checked that it may be deformed and abnormal in shape, structure, and size. This variation may be slight or it may be great. If it is slight it may have no appreciable effect on the vigor and growth of the plant. The leaves become a little firmer and smaller and more resistant to the hot, dry conditions, while the maturer leaves that can not adapt themselves to the change turn yellow and fall, cut off by the parent plant. The plant is better for the change and can live under the modified conditions with greater ease and safety.

If the variation is greater the growth of the plant may be decidedly checked, the leaves being small and many more of them shed. In still more extreme cases the tender leaves may be dried up and killed either wholly or in part. According to Hartig, "It is only when the sickly condition leads to the death of some part of the plant that we may speak of actual disease." Where a few leaves, unable to adapt themselves to a changed condition, turn yellow and fall, the leaves themselves may be diseased, but the plant as a whole is benefited by their loss by being relieved of sources of uncontrolled drain of its water supply. As the loss of leaves becomes greater, however, we pass from the extremely localized disease to a point where the whole or a considerable part of the plant is weakened, either by the direct loss of food that should be furnished by the leaves to the rest of the plant structure, or by the use of reserve food in the reproduction of lost parts. It is evident in such cases that the border line between health and disease is hard to define. The case is not much easier if, instead of variations produced by moisture and temperature, we consider those caused by insects or fungi. A few leaves eaten from a tree by some insect or destroyed by a fungus might have no injurious effect on the tree as a whole, and might even be an advantage, but as the number of injured leaves increases the tree is weakened and



1-6. Brand-fungi (Ustilagineae) of Oats and Wheat, with Spores. 7-10. Potato Rot. 11-15. Rusts, showing effects on leaves. 16. Leaf affected by Hymenomycetous Fungi (Oidium). 17. Oidium-growth 18-23. Ergot-fungus, showing development and effects.

its life threatened. Slight doses of certain poisons stimulate the cells to more vigorous growth, acting as a tonic, while a little larger dose poisons and destroys the cell. Leaving all questions of consistency of definition, we may practically define as diseased all those conditions of a plant which directly or indirectly endanger its life or prevent normal development under given conditions of environment. Or, as Marshall Ward puts it, "We may define disease as dangerous disturbances in the regularity, or interference with the completeness or range of the molecular activities constituting normal life — that is, health — and it is evident that every degree of transition may be realized between the two extremes."

Classification of Diseases.— The method of classification adopted is more a matter of convenience than importance. Most writers in plant pathology base their classifications on the causes of disease. Frank, for example, adopts the following outline: (1) Effects of insufficient room or space; (2) Effects of wounds; (3) Diseases due to atmospheric influences; (4) Diseases due to soil influences; (5) Diseases due to the action of injurious substances; (6) Diseases due to injurious plants; (7) Diseases due to injurious animals; (8) Diseases without any noticeable causes.

Hartig discusses diseases of trees according to the following scheme: (1) Diseases induced by Phanerogams; (2) Diseases induced by Cryptogams; (3) Wounds; (4) Diseases due to unfavorable conditions of soil; (5) Diseases due to unfavorable atmospheric conditions. While a classification based on cause is more scientific and more convenient for the pathologist, classifications based on the plant, the part of the plant attacked and the symptoms, are the most intelligible and convenient for those who devote themselves to the practical cultivation of plants. According to such an arrangement we should have diseases of roses, carnations, violets, lilies, wheat, corn, oats, rye, apple trees, peaches, plums, maple, alder, birch, etc. Under each head we could subdivide into diseases of roots, stems, leaves, flowers, and fruits, and again according to symptoms — decay or loss of parts, swellings, galls, shrinking, cankers, spots, discolorations, etc., finally coming down to the causes. It cannot be too strongly urged that pathologists writing for practical men adopt this latter type of classification at least as a key for the identification of specific diseases, as Hartig has done in his excellent work on the 'Diseases of Trees.' In practice we have in plant pathology, the same as in animal pathology, first carefully to examine, determine, and interpret the symptoms (diagnosis), then to find and study the causes (ætiology). We are then in a position to determine curative measures (therapeutics) or preventive measures (prophylaxis).

The general survey of the subject of plant pathology as planned in this article is based on the following classification:

I. Constitutional conditions — predisposition and immunity.

II. Diseases without apparent cause.

III. Diseases caused by the non-living environment.

- (*a*) Conditions of soil or substratum.
- (*b*) Atmospheric conditions.
- (*c*) Temperature.
- (*d*) Light.
- (*e*) Electricity.
- (*f*) Shock or jars — mechanical.

IV. Diseases caused by the living environment.

- (*a*) Antagonistic association, crowding, isolation, etc.
- (*b*) Vegetable parasites.
- (*c*) Animal parasites.

Constitutional Conditions — Predisposition and Immunity.— A plant may be likened to a very delicately constructed and complex machine automatically adjustable under certain conditions and capable of running and doing work if properly supplied with energy. The accurate and perfect working of the machine depends first upon the perfection of its construction and adjustment, down to the minutest detail. If it comes from the manufacturer with a wheel or screw missing, or the parts incorrectly adjusted or made, it must do its work, if at all, with more or less imperfection, and we may consider that the mechanism has a constitutional difficulty or imperfection. Perhaps a new machine is assembled from parts of old ones so differing from each other that it becomes impossible to produce a perfectly co-ordinated mechanism. Some of the variations that occur in the constitution and organization of plants during the processes of reproduction and development are of the nature of such imperfect construction or adjustment. When these imperfections endanger the life of the plant we have a constitutional disease, or at least a predisposition to disease.

Predisposition to disease may be normal or abnormal. Normal predisposition is where some perfectly normal condition of growth makes the plant liable to injury. Young cereal plants, for example, are liable to infection by smuts, while older plants are quite resistant. When the formation of young, tender growth coincides with the spore dissemination of some fungus or the prevalence of some insect best able to attack growth in such condition, the plant is at this stage normally predisposed to such attack. In the same way there may be normal predisposition to injury by cold, light, heat, etc., but in no case of this kind could the predisposition be considered in any sense disease. Abnormal predisposition is where some abnormal change takes place in the plant from any cause which lowers its vitality or resistance, and which is in itself a pathological condition. Wounds and mechanical injuries may permit the entrance into the plant of insect or fungous parasites, as is the case with many of the wood rot fungi. Injuries from cold or heat may reduce the normal resistance to parasites. Plants which have been severely chilled during rapid growth, though not to the point of killing or even freezing, are often unable to resume normal growth even under the most favorable conditions. They appear to be partially paralyzed and are in this condition extremely subject to insect and fungous attack. So may predisposition develop as the result of starvation, overfeeding, or unbalanced nutrition even before the initiative pathological changes have become chronic.

Genera, species, and individuals vary among themselves in liability to disease or resistance to it as they do in other ways. Races resistant or immune to certain unfavorable conditions or

parasitic enemies are common in nature, and may develop as the result of natural selection, or more quickly and certainly as the result of artificial selection of a natural tendency. If a natural tendency to resistance is not present in a given species, race, or variety, it may be introduced into new generations through the processes of breeding and selection combined. The production of plants for special purposes resistant or immune to certain diseases, is proving of immense value to agriculture. On the other hand, both in natural and artificial selection and breeding, non-resistant or sensitive individuals, varieties, and races may develop or be developed unusually subject to disease.

Seedless or non-fertile individuals may result from too close fertilization, or where the parents are too distantly related; or if seeds are produced in such cases, the individuals grown from the seeds often lack in vigor or reach an incomplete or imperfect development the same as in animals.

Many species of plants, like the violet, strawberry, lilies, and bulbous and tuberous rooted plants in general, are naturally propagated by vegetative offshoots, runners, buds, bulbs, etc., and by seeds. The seed generations under normal conditions are usually the most vigorous and variable. Take, for example, plants from the seeds of *Lilium harrisii* (Bermuda lily), derived from crossing individuals of the same variety, as compared with plants from bulblets of the same individuals propagated for many years by bulb generations, and note the differences. The plants direct from the seed and from the bulbs produced by the seedling generation are relatively much more vigorous than the plants from bulbs distantly removed from a seed generation. The latter are much more sensitive than the former to the attacks of aphides and red mites on the leaves and the bulb mites on the bulbs and roots. The latter are also more sensitive than the former to fungous parasites, and to unfavorable conditions of the non-living environment. The same is true of the cultivated violets, especially the varieties that are propagated from runners and seldom produce seed on account of the doubling of the flowers. Long continued asexual propagation appears in these cases to gradually reduce the power of individual adjustment or adaptation to changes in environment, resulting in decreased vigor and resistance to unfavorable conditions. On the other hand, there are many varieties of plants thus propagated that do not appear to suffer in this way. That it is the cause of predisposition to disease in some cases, and even constitutional derangement, must not be overlooked in the study of the ætiology of a disease.

Diseases without Apparent Cause.— Under this head a number of obscure but well-defined diseases are grouped, the ætiology of which is still unknown. Among these are the California vine disease, peach yellows, and peach rosette, little peach, some forms of gummosis of the stone fruits, die back of the orange, and a score of other diseases, apparently contagious, though the cause has not yet been found.

Variegation.— Formerly variegations were included in this class. These are characterized by the development of white, yellow, or colored spots, blotches, segments, stripes, or bands in the otherwise apparently normal green leaves. The transition from the diseased to healthy cells is usually sharp and well defined from the youngest to the oldest stages of the leaves or other tissues involved. Any particular cell is subject to the disease only while in a state of active division. It therefore never spreads to a cell that has stopped dividing. The diseased cells are usually smaller than healthy cells, and are of much slower growth. The nucleus and protoplasm are more vacuolate, but the most apparent change is in the development of the chloroplast and the chlorophyll. The chloroplasts may be reduced in number and size, and the chlorophyll may be reduced or entirely absent. The change in the diseased cells themselves is often progressive, starting with a reduction of chlorophyll, gradually fading to yellow, then to white as the cell matures. In many cases the disease is transmitted through the seed and is thus hereditary. In others it is propagated only by division of the original plant by buds, cuttings, etc. When a variegated bud or branch is grafted into young, rapidly-growing tissues of a normal or healthy plant of the same variety, branches formed above and below the graft often become variegated, demonstrating that the disease is thus transmissible or infectious. When it once appears in a plant it is very persistent, especially when it has gone to the point of involving the seed generation. Sometimes, however, a plant which has been producing variegated growth suddenly returns to the normal green. While such changes are usually classed as spontaneous variations, they differ in many respects from normal variation. Recent investigations by the writer and others have demonstrated that variegations, including the so-called mosaic diseases, develop as the result of certain disturbances of nutrition of the young dividing bud cells. Certain substances (oxidizing enzymes) present in the cells in an inactive form or in small amount become active or increased in quantity and prevent the development of chlorophyll or cause it to fade. These enzymes injected into the growing points of healthy buds, as demonstrated in the case of tobacco, cause the disease in all dividing cells infected. We have here, then, a toxic enzyme produced by the plant itself under certain disturbing conditions capable of producing the same disease whenever the enzyme comes in contact with dividing cells. The abnormal increase in this enzyme may be brought about in several ways — as by a chill during rapid cell division, severe cutting back, root injury, or defoliation, followed by the production of new growth in the absence of sufficient reserve food, especially proteid. Consult Bulletin 18, Bureau of Plant Industry, United States Department of Agriculture.

All forms of variegation weaken the tissues involved and make them more subject to insect and fungous attack and more easily injured by cold or high temperature. Besides this the changes are in themselves strictly pathological, and threaten or cause the premature death at least of the parts affected.

Albinism.—When the loss of the green coloring matter is complete and apparently spontaneous, not curable by addition of some lacking nutrient, it may be classed with variegations. Other forms of albinism, yellowing or chlorosis are brought about by lack of iron, excess of lime, carbonic acid, lack of light, etc., and will be further discussed when these factors are

considered in relation to disease. The cure and prevention of diseases of this class must be based on securing and maintaining a correctly balanced nutrition for the young cells — protecting them from shocks, especially those due to temperature variations. Peach yellows and rosette, California vine disease, die back of the orange, and diseases of this type can be controlled only by rooting out the diseased individuals upon the appearance of the first symptoms. At the present time we know no cure for these particular diseases. In many respects they behave like variegation or mosaic diseases

DISEASES CAUSED BY THE NON-LIVING ENVIRONMENT.

From what has been said in previous paragraphs, it is evident that unfavorable physical and chemical conditions of the soil, excessive dryness or moisture of the soil or atmosphere, unfavorable conditions of temperature, light, etc., may cause derangements resulting in temporary or chronic disease. Plants which have become adapted by natural or artificial selection to a certain range and sequence of soil, moisture, temperature, and light conditions usually suffer some sort of derangement if exposed to a set of conditions materially different in any particular factor, group of factors, or in the relation of these to each other. It is absolutely necessary, therefore, in studying the ætiology of diseases to know the natural or constitutional requirements of the plants and their powers of adaptation. This knowledge can be obtained only by long and intimate acquaintance with the kind of plants in question under varying conditions.

Soil.— In natural conditions it is a matter of general observation that certain varieties of plants thrive best on particular kinds of soil, the same as in particular conditions of light, temperature, and moisture. The storage and movement of water in soils and its availability to plants, the solution of soil foods, nitrification, temperature, and aëration depend largely upon the structure or physical composition of the soils. Water, food, air, and temperature are among the fundamental requirements of vegetation. It is the varying amounts and relations of these factors maintained by a given soil that largely determine whether or not it is *naturolly* suited in a given region to a particular class of plants. Where all these conditions are under easy control the kind of soil is a matter of less importance. The work of furnishing and maintaining proper conditions is done by the gardener instead of by the soil in the latter case. It is not profitable, however, to employ soils that require close and constant attention, even where conditions are largely under control. It is the aim of economical production to select a soil for a given crop that, with a minimum of labor expended on the part of the cultivator, produces the desired results. It is evident from these considerations that the conditions of the soil must be considered in connection with all of the other factors of environment, as no one of them ever acts independently and alone in the production of disease. The plant, too, has to be considered. It may be adapted to withstand the variations that take place in a sandy soil in a locality characterized by particular meteorological conditions, while it could not thrive in a clay soil in the same locality. On the other hand, with changed meteorological conditions the same plant might do best in the clay soil.

Root Suffocation.— This is one of the most usual diseased conditions caused by physical conditions of the soil preventing the ready access of atmospheric oxygen or the ventilation of the soil. A very fine sand closely packed, or a clay soil with a crust excludes the air, unless the sand is stirred or the crust broken. Carbon-dioxide accumulates and the oxygen is reduced. The root hairs and feeding roots die for lack of sufficient oxygen for respiration. Growth is checked by starvation due to reduced root action. The tissues become hard and woody. The plant may then die in dry, hot weather by desiccation, or it may simply starve to death. Plants injured in this way, even slightly, often become the prey of insects and fungi, especially of those that attack the roots. This form of suffocation is also often found where the roots of plants have to grow under close pavements or hard packed ground or heavy sod. Another form of root suffocation results from poor drainage or excess of moisture in a soil, thus excluding the oxygen and preventing soil ventilation. The feeding roots die and ferment, not only cutting off the proper absorption of soil food elements but resulting in poisoning the plant by products of fermentation. The leaves rapidly turn yellow and drop, and unless the soil is dried out and aërated the plant soon dies. This latter form of root suffocation is very common among plants grown in pots or tubs. When the natural drainage is stopped up or the plant is over-watered, the soil becomes sour.

The best thing to do in such cases is to repot the plant into fresh soil containing a little lime or wood ashes, first washing off the old soil and trimming off the diseased roots. Good drainage must be furnished and over-watering avoided. It must be clearly understood that the roots of all plants require an abundant supply of oxygen, and that they will suffocate and die if they do not get it.

Poisonous materials in the soil are also often the cause of serious root injury. Illuminating gas leaking from gas mains or pipes and diffusing through the soil in the minutest quantity kills and poisons the roots of all kinds of vegetation. The only thing to do in such cases is to stop the leak and air the soil.

The decomposition of organic matter, especially manures rich in nitrogen, in soils not well supplied with oxygen, results in the formation of products injurious to the roots of plants. Injurious acids are often set free from their combinations in the soil by the action of plant roots, bacteria, and fungi, and by chemical changes brought about by the use of certain fertilizers, like the acid of superphosphates. In all those cases a liberal addition of lime to the soil acts as a cure to the injured plant and corrects the acid condition.

Alkali Soils.— In some cases, on the other hand, there is too much lime or other alkaline material such as carbonate of soda, etc., in the soil. The root hairs and feeding roots are killed by a sudden rise of a soluble alkali, or they may die a slow death if there is too much lime. It is a curious fact that a liberal addition of gypsum tends greatly to reduce the injury in both these cases and to raise the limit of endurance

of most crops to alkali. Where alkalies can not be washed out of soils through proper drainage, much can be done by breeding and selecting varieties of plants better adapted to such conditions. Great progress has already been made in this direction with alfalfa, sugar beets, cereals, date palms, etc.

Soil Nutrients.— Every green plant requires for its healthy development, besides water, oxygen, and the CO_2 of the air, a certain proportion of nitrogen in the form of nitrates or ammonia, a salt of potassium and of phosphoric acid, available calcium and magnesium in about equal proportion, sulphur, and a trace of iron and chlorine. If these are not available to the plant in the right form or ratio, or if any of them is too greatly in excess or lacking, a diseased condition of the plants in such soils quickly develops.

Nitrogen.— Lack of nitrogen in available form causes a proportionately diminished vegetative growth, light green or yellowish leaves, even where there is abundant moisture and other nutrient materials. An excess of nitrogenous fertilizer, on the other hand, causes various pathological derangements. Abnormal vegetative growth at the expense of flowers and fruit thus inducing temporary sterility is one of the commonest results of a food containing too much nitrogen in comparison with potassium and phosphoric acid. The tissues in such cases are likely to be soft and watery, easily injured by unfavorable temperature or moisture conditions as well as by insect and fungous parasites.

Tissue degeneration is in many cases the result of over-feeding with nitrogenous fertilizer. This appears to be one of the commonest causes of "die back" or gummy degeneration of the orange. Peaches and plums also suffer from a similar malady from the same cause. Large gum pockets develop in the wood as a result of the degeneration of the cells. The movement of water and food materials in the plant is greatly interfered with. The wood does not mature properly and as a result winter kills, or is destroyed by insect and fungous parasites.

Phosphoric acid is an important constituent of every living cell, entering largely into the composition of the nucleus. Its reduction below the cell requirements is followed by a cessation of cell division and growth and in green cells by disorganization of the chlorophyll which first becomes reddish, then yellow. These latter changes take place first in the maturer leaves, then in the younger parts. An application of phosphates or superphosphates usually promptly corrects these pathological conditions.

Potassium also is required in considerable quantity by all plants. One of the first signs in a plant of a lack of available potassium is a decided cessation of growth without other apparent cause of trouble. During the early stages of potash starvation the plants often retain their normal green color. In later stages very little starch or sugar is made and almost no protein or nitrogenous matter. Unless the missing element is supplied the plants finally become yellow and slowly die. Potassium hastens and perfects the maturing of plants, especially the ripening of the wood of perennial plants, making them less liable to winter injury.

Calcium.— Lack of this element in plant nutrition is first indicated by a more or less marked yellowing of the young leaves due to a reduction in number and size of the chloroplasts though the chlorophyll itself may be normal. The starch made by the chloroplasts is converted with difficulty into sugar. This retardation is probably due to the fact that in calcium starvation the production of the starch transforming enzyme (diastase) is greatly reduced.

Magnesium.— While this element does not appear to be of such fundamental importance to the vegetable cell it is nevertheless absolutely required, especially during the periods of flowering and fruiting. A very small amount may often suffice to meet the requirements of growth up to the flowering period, but at this time a decided lack of magnesium results in the failure to set fruit or its failure to mature. With a more decided lack normal vegetation soon ceases, proleptic shoots develop with shortened stems, small, distorted, yellowish leaves crowded together in rosettes somewhat resembling potash starvation except in color.

It appears to be necessary that magnesium and calcium always be associated in plant cells except in some of the lower classes of plants. The ratio of one part of magnesium to three of calcium is the most favorable in many cases though this is quite variable for different species. In a large number of cases an excess of magnesium over calcium results in greatly retarded growth and an early death of the cells.

Both magnesium and calcium oxides (lime) play a secondary part in the soil by combining with the acids set free by root action, fermentations, and other biological and chemical processes. If these were not at once combined the root hairs and feeding roots would be injured or killed and the plant would suffer from general starvation if not actual poisoning.

Sulphur.— This element usually absorbed by plants in the form of sulphates is one of the absolute requirements of all organisms. It enters into the structure of protoplasm and the more highly organized nitrogenous foods, proteids, required as the direct food of growing cells. Its abnormal reduction results in the cessation of proteid manufacture and consequently causes proteid starvation. Growth ceases and death follows unless the element in some available form is supplied.

Other elements and compounds are often important to the plant though not required. Silica for example is found very commonly deposited in the cell walls of plants, especially in the epidermal cells of cereals and grasses. Its presence stiffens the stems and leaves and in a measure protects them from biting and sucking insects and other small animals. Aside from decreased resistance to such attack a plant grows as well without silica as with it.

Chlorine.— This element in very small quantity appears to be necessary to the vigorous growth of plants, especially during the formation of flowers and fruit. In excess it is usually injurious except to plants adapted to soils rich in chlorides, such as sugar beets, asparagus, celery, etc. It is an interesting fact that sugar beets and celery are rendered much more resistant to spot diseases caused by Cercospora when well supplied with sodium chloride, than without it. Why this is so has not been determined.

Iron.— A small amount of this element is necessary to the formation of chlorophyll. An insufficient amount of iron is indicated very quickly by the formation of chlorotic or white leaves which become green on the addition to the soil of a soluble iron salt, such as iron sulphate. Often the failure of a plant to obtain iron is due to the death of the root hairs and feeding roots from various causes, alkali or acid, excessive moisture or dryness, insect or fungous attack, etc. In such cases, however, there are indications of general starvation as well as of lack of iron, and the diseased condition can be cured only by removing the cause of the death of the roots.

Atmospheric Conditions.— The close co-ordination between the conditions affecting the plant in the soil and atmosphere is at once apparent. In most of our ordinary plants water, with various materials in solution, is absorbed by the roots from the soil and passes up through the stem to the leaves and other parts above ground. From these there is a continual loss of moisture, regulated in part by the plant, but depending largely upon whether or not conditions of the atmosphere, light, etc., favor evaporation, or transpiration as it is more correctly termed where living plants are under consideration.

Moisture Variation.— Plants growing in soil and air uniformly moist have smaller root systems and a larger total leaf surface than they would have if grown under constantly varying conditions of soil and atmospheric moisture. A plant reared in a moist greenhouse will gradually shed its older leaves if the air is allowed to become too dry or the plant is removed to an ordinary dwelling room. The new leaves that develop under such circumstances are adapted to the drier air and are better able to retain the water furnished by the roots. If, however, the change from moist to dry is too sudden, the defoliation will be excessive and the new growth may develop very slowly and be poorly nourished. In the case of house plants there is almost a universal tendency to over-water the plant at such times. This brings on suffocation

and death of the root hairs and feeding roots, and ends in death of the plant. Instead of watering under such conditions the soil should be allowed to become comparatively dry until renewed growth of leaves creates a demand for water from the roots.

Plants which have been growing for a considerable period with a comparatively small water supply develop a large number of root hairs, and firmer and smaller leaves adapted to reduce transpiration to its lowest terms. If a cloudy, wet period suddenly follows, or the plants are over-watered, they become gorged with water. The more plastic tissues start into growth, with the result that the leaves often become distorted, wrinkled, curled, or twisted. If there is a continued excess of moisture many of the root hairs and finer roots may die, and symptoms of root suffocation develop, the leaves become spotted with yellow and finally drop off.

Œdema is a pathological condition characterized by the formation of water blisters or warts on the stems or along the vascular bundles of leaves over-gorged with water. This diseased condition often develops in plants growing in moist situations, especially under conditions where the soil is likely to be warmer than the air, thus favoring absorption of water by the roots but not favoring transpiration through the leaves. The disease often develops, also, in extended periods of moist, warm, cloudy weather.

Burning or Scalding.—The growth that plants make under cloudy, moist conditions is often watery and soft, an easy prey for parasitic fungi, and likely to dry out, wilt, and die easily if suddenly exposed to clear, hot weather. Such "burning" or "scalding" of the edges and tips of leaves is very common in the spring, when moist, cloudy periods are suddenly followed by clear, hot days.

Wind often causes injury by whipping and tearing the leaves or breaking limbs. In the latter case injuries are produced which predispose the plant (especially trees and shrubs) to attack by insects or fungi. Wherever possible all such injured parts should be cut out to uninjured tissue, and protected by antiseptic washes or grafting wax. Dry, hot winds coming early in the summer often cause the death of tender foliage by desiccation.

Injurious Gases.— Slight traces of illuminating gas escaping in rooms or greenhouses, or the slightest trace of sulphurous fumes from burning coal from furnaces or stoves, is extremely injurious to vegetation. The presence of these gases in the atmosphere causes the gradual yellowing, browning, and finally the death of leaves, especially the tips and edges. Although the soil, temperature, and light conditions may be the most favorable, the plants gradually die where they are more or less constantly exposed to a trace of these gases. In the neighborhood of factories or large cities vegetation is often injured, as described, by these and other poisonous gases. In some cases the amount of poisonous gas thrown into the air with the smoke from certain factories is so great that vegetation of all kinds is unable to thrive in the neighborhood. The injury extends often several miles from the factory in the direction of the prevailing wind.

Temperature.— Many predispositions to disease, as well as specific pathological conditions, are produced in plants as the result of unfavorable temperature conditions. As a rule, when growth is taking place and the cells contain much water, vegetation is most sensitive to heat and cold. When growth has ceased and the tissues are mature or in a resting or dormant condition and contain much less water, they are least sensitive to heat and cold. The temperature range for any individual during growth, and even in the dormant or resting condition, varies for different individuals, varieties, and species. These temperature ranges have become more or less fixed within certain limits for different individuals and species through the influence of the temperature factor in the environment under which the species or individuals have developed. Thus, plants adapted to long growing seasons of the South will not thrive in the shorter, colder season of the North. On the other hand, many plants adapted to northern conditions do not thrive in the South. When an individual or a species becomes adjusted or accustomed to the conditions and changes of a particular environment it may be unable wholly or in part to adjust its life processes to an unusual change in any factor or group of factors or the relation of these to each other. The orange, lemon, lime, and numerous other subtropical fruits, for example, do not have a well-defined resting or dormant period like the apple, pear, peach, etc., in the North. They would therefore be quickly killed if exposed to severe frosts.

Certain varieties of peaches and plums which survive Northern winters without injury, when planted in the South often winter-kill. Extended warm spells in the latter part of winter, and the warming effects of the sun on the south and southwest sides of the trunk start the activity of the cambium, which is subsequently injured or killed by freezing, the same as are young buds pushing out too early in the spring under the influence of warm days and then caught by the late frosts.

Varieties that start into growth readily under such conditions may be completely winter-killed if the conditions are such as to stimulate a general premature activity. If only the tissues warmed by the direct action of the sun are involved, patches of various size may be killed. These usually start near the surface of the ground on the southwest side of the tree, and extend up the trunk to the limbs, varying in width from a few inches to the whole south and southwest side.

Winter Sun Scald.— This term is usually applied to cases like those just described where smaller areas on the south or southwest side of trees are illed during winter by the successive warming and freezing of the tissues. This form of injury is common in the North and West. Considerable protection may be afforded in all such cases by coating the tree with whitewash or protecting it from the direct action of the sun in some way.

Winter Desiccation.— Evergreen trees and shrubs are often killed or greatly injured during periods of bright, warm weather in the winter by rapid evaporation of water from the leaves while the ground and roots are frozen and unable to replace what is lost.

Another form of winter desiccation is through the direct action of freezing, where, by intense

cold, the water is drawn so completely from the protoplasm into the cell walls or intercellular spaces in the formation of ice crystals that the cells are unable to re-absorb water on thawing. This effect of freezing is similar in many respects to that of drouth. Water is withdrawn from the protoplasm to a greater or less extent, according to the duration and severity of the cold and the retaining power of the protoplasm. If the withdrawal has not been too great, and thawing process is slow so that the cells can gradually re-absorb what was given up in freezing, the plant may suffer no harm. If on the other hand, the tissues are thawed rapidly, the air is driven out of the intercellular spaces and the cells may die for want of oxygen or the water may be lost by evaporation before it can be reabsorbed. Frozen plants should therefore be thawed slowly and protected from evaporation by sprinkling with cold water or shading. While most cases of injury from freezing are due to the conditions just described, there is another class of cases where the injury is apparently due to structural and chemical changes in the protoplasm induced by the cold.

Cold Rigor.— As already pointed out, the sensitiveness of protoplasm of various plants and at various stages of growth differs remarkably, but in all cases during vegetative activity there is a point either a little above or below the freezing point of water where protoplasmic movement and growth cease without the cells being necessarily frozen or killed. This condition is known as cold rigor, and is often taken advantage of by florists and gardeners in holding their flowers or fruits temporarily in some particular stage of development for a particular market period. Usually when the temperature is raised the growth continues normally, but occasionally, if the temperature is a little too low and long continued, the plant fails to respond again to a higher temperature and is found to be in a state of permanent rigor or paralysis; though the plant does not die, it makes little or no growth.

Mechanical Separation of Cells.— In many parenchymatous tissues, leaves, bark, parenchyma, fruits, etc., which can stand considerable freezing without injury to the protoplasm, there is more or less rupture of the cells from each other by the formation of ice in the cell walls or intercellular spaces. In some cases the epidermal cells are almost completely separated from the rest of the tissue. In other cases, as in apples and bark parenchyma, the individual cells may, in extreme cases, be separated and form a powdery mass. If the separation is complete the cells die after a time. In any case, even a partial separation and breaking of the protoplasmic connections between the cells interferes with normal development, and may cause the premature death of the whole or parts of the plant by interfering with the movement of food materials, etc.

Frost-cracks.— These usually occur as the result of rapid freezing and shrinking of the outer tissues of trees, especially while the inner tissues are relatively warm. After the cold period is over and warmer weather comes such cracks close up.

Frost Canker.— This name is applied to wounds that are prevented from healing through the action of late frost in killing the callus rings as they develop. The killing of roots and the lifting of plants from the soil by freezing are familiar phenomena to all gardeners, but further consideration of this subject can not be undertaken here.

Scorching or Burning.— Sometimes in hot, dry weather smooth-barked trees and shrubs may have portions of their tissue exposed to strong sunlight actually killed by the high temperature. In light-colored, sandy soils the reflection of heat from the sand often kills the lower leaves of low-growing trees, shrubs, and especially of herbaceous plants. The reflection of sun heat from the south or west side of buildings, etc., may also cause similar injury. The direct injury in such cases is often, however, confused with the effects of excessive transpiration. The burning effect of hot, dry winds is largely due to the excessive transpiration they induce. The burning is especially severe when there is an insufficiency of soil moisture as the result of drouth or lack of proper cultivation.

Sudden Variations of Temperature.— As already indicated, the injury resulting from changes of temperature above the maximum or below the minimum for a species or individual depends in large measure upon the rapidity of the change. If the change is slow, even the individual plant may adjust its vital processes to temperatures which would have resulted in death had they been sudden. Some of the algæ, for example, live in hot springs at a temperature of 93° C., while the original stock from which these forms were derived lives in water rarely exceeding 40° C. A transfer of individuals from 40° to 93° would result in almost instant death, while by slow, gradual change they could be accustomed to this extreme temperature. For flowering plants (Phanerogams) the possible maximum is much lower, 50° being the extreme limit, while the average limit is from 37° to 46°.

Sudden variations well within the fatal limits, however, are productive of pathological changes. A rose, tomato, violet, or almost any other plant grown at a cool temperature (8° to 15° C.), all other conditions remaining the same and then suddenly exposed to 24° to 27° C., will turn yellowish, become weak and spindling and very sensitive to insects and parasitic diseases. The same plants, started at 24° to 27° and growing normally at that temperature, if suddenly dropped to 15° or 8° become yellowish and weak and very sensitive to parasite enemies. In either case the change from one temperature to the other could be made without serious injury if made gradually and slowly. For a general discussion of this subject with references to literature, consult Davenport's 'Experimental Morphology.'

Resting or Dormant Period.— A resting or dormant period is more or less well defined in many perennial plants. In northern and temperate latitudes this period coincides with cold weather and has developed in response to this constantly recurring seasonal change. In other cases in hot climates a partial rest may occur during the dry season. In many cases this period of rest has come to be a necessity to the normal and healthy development of the plant. Detmer and Müller-Thurgau have shown in the case of potato tubers and many dormant buds that in the fall and early winter the tissues contain only enough sugar to meet the demands of

respiration of the dormant cells, not enough to stimulate growth. Müller-Thurgau has demonstrated that exposure of tubers dug in August to 0° C. for a few weeks causes an accumulation of sugar sufficient to start normal germination when the cooled tubers are placed under favorable conditions. The cold reduces the amount of sugar used in respiration and probably also causes an increase of diastase, the enzyme that converts starch into sugar. The same has been shown to be true also in the case of the dormant buds of many trees and shrubs. Exposure of dormant buds, bulbs, tubers, etc., to sulphuric ether for several days has a similar effect to that produced by exposure to cold. In the case of plants that have their dormant or resting period in dry weather there is an accumulation and modification of reserve foods preparatory to the next season of growth. Buds, bulbs and tubers may often be forced to grow before they have accumulated sufficient reserve food in the proper form, but the result is usually a weak plant very subject to disease. A good example of this may be seen in the attempt that is often made to force bulbs that are immature and that have not had their normal period of rest or have been forced the previous season. Variegation or mosaic disease is also often produced in this way.

Light.— Practically all the chlorophyllaceous plants are dependent upon sunlight for normal development and activity. Every individual and every species is adapted or attuned to a particular range of light intensity, and suffers injury if the intensity becomes too great or too small, or if the change from one intensity to another is too sudden.

Injury from Strong Light.— Many bacteria and fungi, for example, *Bacillus anthracis* and *Botrytis cinerea*, grow best in darkness or very weak light, but are killed in a short time by exposure to sunlight or to artificial light strong in the blue-violet rays. It is this portion of the spectrum that causes the chemical disorganization of the protoplasm, or rather its destruction by oxidation as in the absence of oxygen during exposure no change takes place. The same is true of the more highly developed chlorophyllaceous algæ and shade plants — too strong light not only destroys the chlorophyll by oxidation induced by the blue-violet rays, but the protoplasm itself may finally be thus killed or chemically disorganized. This is also well shown in the injurious effect of the ultra-violet rays in the naked electric arc light. A glass globe which cuts off these rays prevents the injury. This pathological condition in varying degrees of intensity is produced not only in shade plants when exposed to direct sunlight, but also in other plants when grown in the shade and suddenly exposed to strong light. It is also common when an extended period of cloudy or foggy weather in the spring is suddenly followed by bright, clear days. Under such conditions there is not only a partial destruction of the chlorophyll, but an excessive loss of water from the poorly cuticularized leaves. Such leaves are also unable to close their stomata quickly, which is another reason for their suffering from excessive loss of water. The action of light in promoting evaporation or transpiration is mainly by raising the temperature of the tissues above that of the surrounding air. When the air temperature is very high the increased temperature of the tissues of plants exposed to strong sunlight is often sufficient in itself to cause injury or death.

Injury from Weak Light.— While too strong light can not be endured by any plant, lack of light is injurious only to chlorophyllaceous plants. When the light intensity is reduced below the minimum for any of these plants the synthesis of carbon and nitrogen compounds is reduced accordingly until in very weak light or darkness the plant can make no use whatever of the carbondioxide of the air. That the plant will starve in proportion to the reduction in photosynthetic activity is evident.

Electricity.— That electrical conditions of the earth and atmosphere and of the plant have an important relation to the physiological condition of the latter has been demonstrated in many cases, but the full significance of this relation is not yet understood. Plants vary in sensitiveness to electric currents in much the same way that they do to light or heat. A current above the maximum for a plant causes the disorganization and death of the protoplasm. This is often accomplished by a comparatively weak direct or alternating current, but is perhaps most familiar in cases of injury or death from currents of high intensity, as from electric light wires or lightning stroke.

Mechanical Injury.— Finally, among the causes of disease in the non-living environment, we have to mention mechanical injuries, such as those produced by hail, wind, falling trees, etc. Hail stones often severely cut and tear the foliage of trees and herbaceous plants, and may also produce more or less serious wounds in the more resistant tissues. Wind may injure the foliage, break limbs, etc., as may also falling trees. In all these cases, except in the most severe forms, the greatest danger comes from the entrance into the tissues of the wounded plant of parasitic insects and fungi. Large mechanical wounds, however produced, should have antiseptic treatment where practicable, especially in large and valuable trees. The injured parts should be trimmed to healthy tissue in such a manner as to favor rapid formation of callus. After a wash of some disinfectant, such as copper sulphate 1 per cent solution in water, the wound should be protected by shellac or grafting wax, or white lead paint.

DISEASES CAUSED BY THE LIVING ENVIRONMENT.

Struggle for Room.— The results of crowding are so familiar and apparent that discussion of the subject is scarcely required. The strong plants occupy the soil with their roots and the air space with their leaves and branches, crowding out the more backward or weaker individuals or species. Some are thus starved to death, others are reduced in size and vigor according as they lack the proper space in which to grow.

Plant Associations.—Plant associations spring up controlled by certain dominant species. Each individual of such a community has its influence on the others. The shade of a tree keeps back some sun-loving species and makes it possible for shade-loving species to grow, and so, with countless inter-relationships, plant communities develop, often of great complexity. If the tree or other dominant factor is removed the changed conditions are followed by a breaking-up and readjustment according to the new conditions. Many of the former occupants of

the area will be starved or crowded out in the struggle. Others may suffer from excess of light or too high temperature. Disregard of the natural requirements of plants and their interrelations in communities often leads to disastrous results in clearing or planting in landscape gardening.

Symbiosis.— This term was first used by De Bary to designate plant partnerships such as those represented by the co-operation of fungi and algæ in the formation of organisms known as lichens. The fungous hyphæ surround the algæ cells and furnish them with water and dissolved salts from the substratum, and the algæ in return supply to the fungus hyphæ the required organic nutrient materials. The community forms in itself a specific vegetable organism, though under favorable conditions of nutrition both the fungus and the alga forming the lichen may live independently of each other. Another type of symbiotic relationship is found in the so called *Mycorhiza*, or fungus roots. These are specially common on plants growing in humus. Two types are distinguished, one where the fungus is in close external union with the roots, covering them with its filaments and preventing the formation of root hairs, actually taking their place by supplying the plant not only with water and mineral food but also with organic nutriment from the humus. These external associations are usually termed ectotrophic mycorhiza.

Monotropa hypopitys is a good example of a non-chlorophyllaceous plant dependent upon ectotrophic mycorhiza for its food. Among forest trees the phenomenon is very common, especially in the *Cupuliferæ* and *Abietineæ*. That the fungus mantle in these cases supplies the host with food materials from the humus has been amply demonstrated. Ordinarily the host plant in these cases furnishes little or nothing to the fungus, which is able to obtain all its nutriment from the humus. In some cases, however, the Mycorhiza fungus has been observed to penetrate the root sheath and become parasitic. It is a short step from this condition to the cases where the fungus is normally internal, forming the so-called endotrophic mycorhiza, as in many of the *Orchideæ, Ericaceæ, Epacrideæ, Empetraceæ*, and representatives of other groups living in humus soils. In many of these cases, while the plants are not in any way apparently injured by the fungus, they can thrive as well without as with it, and the relation of the fungus to the host has not as yet been fully investigated. Among the *Leguminosæ*, however, the case is different. All legumes in their native soils have their roots covered with "tubercles." These develop as the result of stimulation produced by certain bacteria which enter the young roots through the root hairs and grow symbiotically within the cells. The bacteria draw their organic nourishment from the stores in the root, and in return secure nitrogen directly from the atmosphere which afterward becomes available to the legume. Legumes with these tubercle bacteria can thrive in a soil absolutely devoid of nitrogen, whereas, without the bacteria, they could not live at all in such a soil. The failure of legumes to thrive in certain soils is often due to the absence of these tubercle organisms. On the other hand, the tubercle organism often degenerates into a mere parasite. Similar organisms are also found in symbiotic relation in the alder and in several other groups of plants.

Vegetable Parasites. The true vegetable parasites (obligate parasites) are those which can not, in any phase of existence or stage of development live independent of the host plant. There are many true parasites both among the higher and lower orders of plant life. Many organisms, however, are parasitic during certain stages of their development, and saprophytic in other stages; where the parasitic nature is predominant they are called hemi-parasites; if the saprophytic phase predominates they are classified as hemisaprophytes. All of these classes are responsible for the production of diseases of various types. The true saprophytes, which live entirely on dead organic matter, are seldom the cause of diseases. The diseases of plants due to vegetable and animal parasites constitute by far the larger number of diseases and are those of greatest economic importance. In some cases, as previously suggested, it is difficult to determine whether we are dealing with a harmless symbiotic relationship or one where the host is more or less injured. In this doubtful category, for example, are to be placed the mistletoes (*Loranthaceæ*). These plants possess leaves containing chlorophyll, and are related to their host the same as a scion to a stock. The true mistletoe of Europe (*Viscum album*) and its relatives in America (*Phoradendron flavescens*) are parasitic on a great variety of deciduous trees, and sometimes do considerable damage. Here also must be placed those endotrophic mycorhiza of many plants growing in humus where neither benefit nor injury has been shown as a result of the presence of the fungus in the roots. Among the phanerogams, however, there are many true parasites, for example, the *Orobanchaceæ*, which are devoid of chlorophyll and derive all their nourishment from the roots of the host plants to which they are attached. These parasites often do considerable damage to tobacco, hemp, lucerne, clover, and other crops. The Dodders (*Cuscuta*) are also true phanerogamic parasites, deriving all their nourishment from their host plants, which they overrun and penetrate with their sucker roots (haustoria). The most dangerous and prolific disease-producers, however, are the pathogenic fungi and bacteria.

Pathogenic Fungi.— The consideration of diseases caused by pathogenic fungi is usually based upon the fungus, and the genetic relationships of the fungi usually determine the order in which the diseases are discussed.

While this practice is undoubtedly the best one to follow in a systematic treatise, it is probably the cause of the erroneous impression sometimes encountered that the fungus is the disease. The disease is the functional or cell derangement of the plant or part of the plant. The same functional or cell derangement, and therefore strictly the same disease, may in some cases be produced by a great variety of totally unrelated causes. More attention should be given in plant pathology to the study of the disease itself, though not less attention should be paid to the determination and study of the cause. This latter course is especially necessary in the case of the pathogenic fungi, bacteria, or insects. A complete and accurate knowledge of the life history and nutritive requirements of pathogenic organisms furnishes

the best foundation on which to base the procedure for preventing or controlling the diseases caused by them. As already suggested, there is every possible gradation among the pathogenic fungi, between the strict saprophyte (such as sooty molds), causing disease only by chance association, and the strict parasite (such as rusts and smuts), unable to exist independently of their living hosts.

Among the diseases caused by strict saprophytes may be mentioned the starved and chlorotic condition of many leaves and fruits due to the presence of sooty molds on their surface. These black, mold-like fungi grow in sugary excretions, especially the "honey dew" excreted by insects, aphides, scales, leafhoppers, etc. This black growth, where it covers the surface of leaves, occasionally cuts off so much light that the chloroplasts lose their green color, and the formation of starch and sugar is so greatly reduced as to cause partial starvation and general retardation of growth of the whole plant. This is intensified by the injury produced and the food removed by the insects.

Many of the saprophytic yeast fungi, molds, and bacteria cause fermentive decomposition in the weakened and dead cells of the wounded tissues, especially those rich in sugar or other reserve materials. Toxic products are thus produced which weaken or kill all the cells absorbing them. Such fermentations are especially common following mechanical injury to ripening fruits and to the sapwood of trees, in the latter case particularly following the work of borers. Fungi of this class grade imperceptibly into the hemisaprophytes or facultative parasites which start their vegetative development in dead or weakened tissues like the heartwood of a tree or the dead tissue of a wound, and then gradually spread into the living tissues, killing them. The best examples of this class are the wood-destroying *Polyporeæ* (bracket fungi), *Agaricineæ* (toad stools), and related fungi. When these get into the heart-wood through a wound, or into an area of dead cambium bark or sapwood, they first fill the dead area with their mycelium and gradually spread into surrounding living tissue, in some cases by secondary action through decomposition products, or by cutting off the water or food supply from the living tissues, or by primary action, where the mycelium spreads from its saprophytic vantage ground directly into the neighboring living tissue.

In order to prevent wound infection of woody plants it is necessary either to keep the surface of the wound dry, preventing the exudation of sap and the entrance of water by searing with a hot iron, or by treating the injured surface with an antiseptic or protective coating, paint, or wash, such as coal tar, white lead, copper sulphate, etc.

Besides the hemisaprophytic wood-destroying fungi which gain entrance through wounds and are not able otherwise to infect a sound plant, there are others of the same class, such as *Agaricus mellcus*, whose mycelial strands or rhizomorphs are able to work their way through the sound bark of numerous conifers, underneath the bark and in the wood of which the fungus produces dense white, felt-like mycelial membranes. These kill the bark and wood and stimulate an excessive flow of resin into the injured parts, finally resulting in the death of the tree. This same fungus also attacks deciduous broad-leaved trees, but here it is more particularly a wound parasite.

Botrytis, Pythium, Sclerotinia, and many other fungi, though able to pass the whole of their existence as saprophytes, are also able under favorable conditions to infect the living tissues of plants and destroy them. It is a short step from these fungi to those of a slightly more decided parasitic nature, the *hemiparasites,* organisms which can not in nature complete their life history as saprophytes. The *Ustilagineæ* (smuts) are among the most familiar examples of this class. These grade imperceptibly into the strict parasites such as the *Uredineæ* (rusts), which can not live at all as saprophytes.

Among the strict parasites there is often a high degree of specialization, a given species of fungus being restricted in many cases to a particular genus or even species of plant. In some of the rusts there is a peculiar phenomenon of this nature known as heteroecism. Many species of rusts go through their whole life history producing all their various forms of spores on the same host. In other cases, however, spermatia and æcidiospores are produced on one host and the uredospores and teleutospores of the same fungus are produced on an entirely unrelated host.

Injury Caused by Parasitic Fungi.— It is extremely difficult to classify the various reactions of plants to parasitic attack. Every case has to be considered in a large measure individually. There are, however, certain general types of reaction and injury that may be noted. There are many parasitic fungi, for example, that attack the leaves of plants; some of these, like the powdery mildews, grow only on the surface of the leaves and younger stems, forming powdery, whitish spots or coatings and drawing nourishment from the surface cells by sending down into them short, root-like growths, *haustoria.* When these surface parasites attack the young growing leaves, stems, or fruits, the areas occupied by the fungus are greatly retarded in development, often causing more or less distortion of the leaves, and in severe cases often killing them and causing early defoliation. The flowers and fruit may thus also be destroyed. The proper ripening and maturation of the wood of perennials is often so much retarded by these direct and indirect effects that it winter-kills. When these fungi, however, attack only a few leaves on a plant, or where they attack the leaves after they are full grown, the injury is comparatively slight. Prompt burning of the fallen leaves in autumn is one of the best preventive measures. Sulphuring, so widely practised in the case of vine mildew, helps to rid plants of the fungus, and spraying with Bordeaux mixture is a good preventive as well as curative treatment.

Besides these external parasites there are a large number which penetrate and vegetate directly in the cells or in the intercellular spaces of the host. Some of these after a time kill the tissues in which they are growing, producing a dead area. If these dead areas are in the leaves and are numerous or large, the value and working power of the leaf may be seriously impaired or destroyed altogether. The destruction of the first crop of leaves often results from the attack of leaf-spot fungi early in the summer, and the plants are obliged to put out a

second crop of foliage. This must be done at the expense of reserve food stores. In such crops as sugar beet, Irish potato, etc., this use of reserve food becomes evident in the reduction of yield of tubers and sugar. In crops like beets and potatoes, where there is a continual succession of new growth, a second attack is not so serious as in the case of trees and shrubs where two successive defoliations either kill the plant outright or so weaken it that it winter-kills or dies of starvation. The weakening effects of premature defoliation are often not fully realized. Where one premature defoliation has occurred from any cause, great effort should be made to protect the second crop of leaves and to stimulate the plant with nitrogenous fertilizers. If the plant is a perennial, some protection, if possible, should be furnished during winter, as the wood is likely to be poorly ripened. Practically all the leaf-spot diseases are easily controlled by spraying the foliage with Bordeaux mixture or other good fungicide. Immediate removal, if possible, and burning of the diseased leaves also serve to hold these diseases in check.

If prompt action of this kind is taken when the trouble first appears it may often be checked without other treatment. It is safest, however, to spray other plants with a fungicide whenever practicable.

Many fungi which may start by attacking the leaves are not limited to them, but spread to or even directly attack the stems. The *Peronosporeæ*, or downy mildews, are good examples of this class. Plants which have developed in moist, cloudy weather are particularly sensitive, and the parasite starting in leaves or stems may in a few days invade all the tissues of the plant, causing a rapid soft rot. The well-known "potato rot," often causing the complete destruction of the crop in a few days, is caused by one of this group of fungi. Many other crops are similarly affected by fungi of this group. Like the leaf-spot fungi, these are easily prevented from gaining entrance to the tissues of plants by keeping them well sprayed with Bordeaux mixture or other good fungicide.

The root rot and damp-off fungi — *Rhizoctonia, Ozonium, Agaricus mellcus, Botrytis, Pythium, Fusarium,* etc., usually attack the plant through the roots or base of the stem, and cause a more or less rapid decay of the invaded tissues, followed by the starvation and death of the whole plant.

The cultivation of resistant individuals or the use of uninfected or sterilized soil and attention to general cultural conditions, especially rotation of crops, drainage, and aeration of soil, are the best preventive measures for diseases of this type.

In other cases stems and leaves may be invaded by fungi (rusts or smuts), but rotting or sudden death of the tissues does not occur. The plants may, however, be so reduced in vigor that they fail to mature. The cereal rusts, for example, often greatly reduce the yield of grain. In case of the smuts the grain is replaced by the spores of the fungus, but the plant is apparently not otherwise injured.

Hypertrophy.— In some cases the tissues attacked by fungi are stimulated to excessive growth. Finger and toe disease of turnip roots caused by *Plasmodiophora*, plum pocket and "leaf curl," "witches' brooms," etc., caused by *Exoascus*, the large galls on *Vaccinium* and *Rhododendron* caused by *Exobasidium*, the large swellings produced on conifers by *Peridermium*, etc., are good examples.

Pathogenic Bacteria.— The casual relation of bacteria to numerous animal diseases has been the subject of much careful study, but until recently there were only a very few plant diseases known to be caused by these organisms.

Among the best known examples may be mentioned the "fire blight" of pomaceous trees, especially pear and apple. The tops of the trees are killed back as if burned by fire. The bacillus causing the trouble is carried from tree to tree by bees and other insects. The principal infection is through the nectaries of the flowers, and possibly, also, through the glands or water pores of the young leaves. The twigs are usually killed back for a few feet, then as the wood begins to mature the bacteria usually die, except where they have invaded a large limb or the body of the tree. To prevent the disease being carried over from season to season it is necessary only to find and remove all these latter sources of infection.

A bacterial disease of the English walnut on the Pacific coast is a serious menace to the culture of these trees. A bacterial gall or tumor of olive trees is serious in Europe, and has appeared in some of the olive groves of California. Among the bacterial diseases of vegetables may be mentioned the bacterial rot of the tomato, egg plant, and Irish potato, carried by biting insects, the brown rot of cabbages, and a bacterial disease of sweet corn entering the tissues through water pores in the edges of the leaves. Numerous other plant diseases have been shown to be due to bacteria, and the number will probably be greatly increased as the field is more carefully worked.

Diseases Caused by Animals.— Next to diseases of vegetable origin, those caused by animals, especially insects, are the most numerous and destructive. Many fungus and bacterial diseases are carried from plant to plant by insects; for example, pear blight by bees, potato rot by potato beetles, ferment and wood-rot fungi by boring beetles, etc. In the case of pear blight the bees, though they are carriers of the disease, are beneficial to the trees in aiding pollination. In other cases the injury caused by the insects may in itself be serious. The biting insects may in some cases cause more or less complete defoliation, or the sucking insects and mites may so reduce the stores of plant food as to seriously interfere with growth. Among the best known and most injurious of these are the scale insects, mealy bugs, plant lice (*Aphidæ*), leaf hoppers, and the "plant bugs" (*Capsidæ*). All of these feed on the sap of the plant by sucking it out of the tissues, but causing little or no mechanical injury to the cells. In many cases there is simply a general or local retardation of growth due to the removal of sugars and proteids; in other cases irritations are set up, possibly by some material injected into the tissues by the insect, resulting in gall-like swellings or various hypertrophied developments of the parts attacked, for example, *Phylloxera* on the leaves and roots of grape; woolly apple louse (*Schizoneura*) on roots of apple; *Colopha*, cockscomb gall on elm, etc. In other cases the growth of the tissue is checked, as where tis-

sues are attacked by scale insects such as San José scale, and by many of the plant lice and leaf hoppers. In other cases growth is neither checked nor accelerated, but definite spots are produced which continue to enlarge, resembling a fungus or bacterial infection (*Stigmonose*) or puncture diseases, etc.

Borers may more or less completely ring a tree, cutting off the connection between root and leaves and thus resulting, in many cases, in death. Hypertrophy of tissues is also often the result of insect attack. Many insect larvæ developing from eggs laid in young tissues cause, by the irritations they set up, growths known as galls. Nematode worms attacking the roots of plants also cause gall-like swellings.

As in the case of the fungi, the complete life history and habits of any particular injurious insect must, as a rule, be determined before the greatest success in controlling it can be attained. Many insects have their natural enemies, which, if favored, may hold a serious pest in check. The development of natural resistance in plants by selection is also an important means of preventing injury in certain cases. And finally, the use of insecticides must be resorted to, as arsenic, etc., for biting and eating insects, and contact poisons for sucking insects.

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Disentis, Switzerland, a village in the canton Grisons, situated on the Hither Rhine. It is about 31½ miles southwest of Reichenau, and 3,600 feet above sea-level. The monk Sigisbert, a disciple of Saint Columba, is supposed to have founded a large Benedictine monastery here in 614. Pop. (1900) 1,400.

Disestab'lishment, specifically the depriving a Church of its rights, position, or privileges as an established Church; withdrawing a Church from its connection with the State. A bill for the disestablishment of the Irish Church was introduced into the British House of Commons by Gladstone 1 March 1869. It was passed by Parliament within a few months of its introduction but did not take effect till 1 Jan. 1871.

Disfran'chisement, the act of depriving a person of any privilege, liberty, franchise, or immunity, such as depriving a member of a corporation of his corporate rights. It is distinguished in this case from "amotion," which refers to the removal of an officer of the corporation from office, without affecting his membership. Another instance is the act of depriving a person of the rights and privileges of citizenship. This term is often applied to the act of depriving a citizen of the right to vote, and in Great Britain to the Act which deprives a constituency of the right to return a member to Parliament.

Dishonor, the refusal or omission of the drawee of a bill to accept, or of the acceptor of a bill, or of the maker of a promissory note to liquidate the obligation, on its maturity. There are generally three parties in a bill or note transaction, the holder, the drawer, and the person by whom the bill or note is payable, whether he be the maker or acceptor of it. In case the bill or note is dishonored, the holder must at once notify the endorser and the drawer, if the paper be a draft or bill. Then the drawer, if there be funds of his in the hands of the drawee, will have an opportunity of withdrawing them. If a banker refuses to pay a customer's check, while holding an account of that customer sufficient to meet such check, he makes himself liable for damages.

Disinfec'tants, agents used for destroying or rendering inert the germs of infectious diseases. It has been amply proven that a large number of diseases are of microbic origin, and when these low forms of microorganisms are introduced into the body of susceptible individuals they multiply and thereby become capable of producing certain diseases, which are called infectious. Any agent capable of destroying these organisms is a disinfectant or germicide, and through disinfection we have a powerful and effective means of controlling these diseases and checking the spread of them.

In order to disinfect thoroughly, we must first trace the source of infection. In the eruptive fevers, such as measles, scarlet fever, smallpox, etc., the infectious agent comes directly from the body, attaching itself to the clothing, bedclothes, etc., and to objects handled by the infected person. The same is true of infectious skin-diseases, such as barbers' itch, ringworm, etc. In pneumonia, tuberculosis, diphtheria, and whooping-cough, the sputum and the breath take the germ of infection; in cholera, the alvine discharges, and possibly vomitus; in typhoid fever infection is largely due to the specific germ found in the discharges from the bowels; in malaria, anthrax, and elephantiasis, the germ is found in the blood; in hydrophobia it occurs in the saliva, spinal cord, and brain; in gonorrhœa, in the urethral discharges, etc. Some of the infecting agents do not multiply outside of the body, while others under favorable conditions are very procreative; therefore the object of disinfection is to destroy all infected material and, where this is not admissible, to subject it to a process of disinfection inimical to the life of the infecting germ. This must be complete and thorough. The selection of an appropriate disinfectant for each germ is the result of laboratory research. A culture of a germ is made in a medium best adapted to its propagation, and by experimenting with various agents one (or more) is found which proves most destructive to the germ, in the shortest possible time. The best and cheapest disinfectants known are supplied by nature, namely, sunlight and air.

Fire and heat are the most powerful disinfectants known. In the use of heat various kinds of mechanical apparatus for both dry and moist (superheated steam) heating are used. Boiling infected clothes, with or without the addition of a chemical disinfectant, is a popular means of disinfection. Where it is impossible to use either of these agents, gaseous elements are introduced. Cold (freezing) is a natural disinfectant, but fails in the case of typhoid germs, which have been known to resist freezing after 103 days; and the same is true of the tuberculosis germ. Camphor, medicated papers, or the burning of incense, may clear an odorous atmosphere impregnated with sewer-gas or fumes of decomposing animal or vegetable matter: but these are not disinfectants.

Of late the utility of disinfection has been forcibly demonstrated, and most cities and quarantine stations have established plants for steam disinfection. Clothing, bedding, etc, known or believed to be infected are placed in chambers or cylinders and subjected to a pressure of superheated steam (220° to 230° F.) for 20 or 30 minutes. This thoroughly disinfects all infected material. Dry heat is not so effective. The ideal disinfectant for all practical and domestic purposes, both inexpensive and easy of application, is chloride of lime in the proportion of six ounces to a gallon of water. All typhoid or cholera stools, likewise the sputum of pneumonia or tuberculosis patients, are rendered innocuous by it in less than 30 minutes. Carbolic acid in the proportion of four ounces to a gallon of water will destroy most bacilli, but not their spores. It is highly poisonous, and very destructive to the skin, therefore to be used with caution. Corrosive sublimate, in proportion of one part to 1,000 parts water, is not only an efficient disinfectant, but a powerful insecticide as well. It can be applied to woodwork, walls, floors, etc., but its corrosive action on metal renders its uses limited on sewers, drains, and the like. Milk of lime or common whitewash, so highly recommended by the German government in the cholera epidemic of 1892, is a ready and efficient means of disinfection. This may be prepared by sprinkling a quart of quicklime in a suitable vessel and, when the lime is reduced to a powder, adding three or more quarts of water, allowing the mixture to stand. It may then be applied with a brush to walls, floors, etc. Drains are flushed, and all excreta from infected cases treated with equal parts of lime solution.

The use of chlorine and sulphurous gases is objectionable because of their irritating qualities. Sulphur fumes are falling into disuse, in consequence of the foul odor and failure to accomplish the end sought. A more modern disinfectant is made by subjecting methyl-alcohol to oxidation, and is commonly known as formalin. It is readily soluble in water, does not destroy clothing or furniture, and is virtually non-poisonous. It is used in the preservation of meat and food, for disinfecting surgical instruments, for the washing out of sinuses and of indolent and foul ulcers, and for the disinfection of dwelling-rooms. Solid formaldehyde being introduced into a generator and burned, the resulting gas quickly penetrates all cracks and crevices, and renders the air clean and pure, besides destroying all infectious germs.

Most of the metallic and acid disinfectants are more or less objectionable on account of their destructive action to the skin and tissues. Permanganate of potash, osmic acid, bromine, and iodine are useful in their respective places. In all cases of infectious or contagious diseases disinfection should be complete; articles infected should be burned, boiled, or disinfected, and not buried or thrown into sewers before being treated with a proper disinfecting agent, for infecting germs have been known to lie dormant for years.

Disinfection, popularly speaking, the process of destroying infectious organisms. Various modes of general disinfection have been in use for a number of years, most of which are extremely crude and inefficient. It is becoming recognized more and more that a general mode of procedure for dealing with infectious organisms is of very little value, and it is becoming more and more evident that individual disinfection for each and every type of disease-producing organism is necessary. Thus the old-fashioned mode of disinfection in yellow fever, by means of steam, heat, chlorine gas, sulphur, etc., are shown to be absurd in the light of modern knowledge, as yellow fever is conveyed by means of mosquitoes, and as the knowledge concerning the cause of infectious diseases is becoming more and more definite, the means of preventing the spread of such diseases by proper disinfectants is taking on a more individual character. In any application of the principle of disinfection the first question necessary to ask is, by what agents and through what channels is a given disease propagated? Thus in diphtheria, it may be vastly more important to cleanse the throats of all persons who have come in contact with a diseased patient, than it would be to burn barrels of sulphur in a room where a sick child had lived. In typhoid fever it is now well recognized that the bacillus of the disease is eliminated in the fæces and in the urine, and that flies and small animals are capable of carrying about on their feet the micro-organisms. Therefore if one would properly disinfect a typhoid fever patient, it is necessary to take great care with the fæces and urine and other excreta, and, as far as possible, exclude all insects from the room. Of the value of general disinfectants, such as the burning of sulphur in a room, or the use of formaldehyde gas, or the cleaning out of ships and railway cars by aërial disinfectants, the writer believes them to be generally inefficient* In this encyclopedia individual prophylaxis against contagion is described under each infectious disease, and can best be consulted in its proper place. See ANTISEPTICS; BACTERIA; DISEASE; GERMICIDES; INFECTIOUS DISEASE.

*The best disinfectants are fresh air and sunlight. Steam, boiling water, and burning are the best means of cleansing clothing. Formaldehyde gas is one of the best means of ridding a large room from noxious insects, and as a general disinfectant.

Disintegra'tor, a machine in which various substances are pulverized or crushed by beaters projecting from the faces of parallel metallic disks revolving in contrary directions. There are disintegrators for ore and for grain, and one form is used for mixing mortar.

Dislocation, the displacement of one bone from another with which it forms a joint. Thus by dislocation a limb is said to be put out of joint. Dislocations are the result of either disease, accident, or congenital malformation. The displacement may be either partial or complete, and cases are classified as simple, when the skin remains unbroken, and compound where a wound lays bare the bone; when a fracture of the bones, and injury to important blood vessels aggravates the case, the dislocation is said to be complicated.

The general treatment of dislocations consists in reduction, that is, drawing back the displaced joint into its socket. The contracted muscles oppose this reduction, and sometimes their spasmodic action has to be overcome by the administration of chloroform or ether. Up to the year 1870 or thereabouts the reduc-

tion was generally effected by extension, that is, by pulling out the displaced limb, and stretching the restraining muscles until they are exhausted, when the bone would generally slip back into its place with an audible snap.

Of late years, however, reduction by extension has been to a very large extent given up in consequence of the general adoption of reduction by manipulation. This method, known it seems from ancient times, but curiously neglected, consists in executing certain complex movements of the dislocated limb which effect the return of the displaced bone to its socket by ingeniously utilizing its unruptured attachments and evading the opposition of the muscles, by fraud rather than by force. It is particularly applicable to the hip, which, as it is commanded by the strongest mass of muscles in the body, always presented the most formidable obstacles to the old method. The first paper on this subject which attracted general attention was by Dr. Reid of Rochester, N. Y. (1851); and in 1869 Prof. Bigelow of Boston published a careful and exhaustive discussion of injuries to the hip, with such full and clear directions for the manipulation method, as to secure its general adoption in the case of this joint by surgeons in Great Britain as well as in America. The method, however, had been described and used in France and elsewhere, though with less care and precision, in the earlier half of the 19th century.

In cases of congenital dislocation of the hip bone and other congenital misplacements of the bones, manipulation, intensified into powerful massage, has been developed practically to a wonderful extent by Dr. Adolf Lorenz, an Austrian surgeon who has lately visited this country. See Lorenz, Adolf.

Dislocation (in Geology). See Fault.

D'Isly, Duke. See Bugeaud, Thomas Robert.

Dismal Swamp, Great, a tract of marshy land, beginning a little south of Norfolk, Va., and extending into North Carolina; containing 150,000 acres; 30 miles long, from north to south, and 10 miles broad. This tract was entirely covered with trees, with almost impervious brushwood between them, but it has now in part been cleared and drained and is devoted to agriculture. In the midst of the swamp is Drummond's Lake, seven miles in length, the scene of Thomas Moore's 'Lake of the Dismal Swamp.' In 1899, the Dismal Swamp canal, connecting Chesapeake Bay with Albemarle Sound, which from about the beginning of the 19th century to the close of the Civil War was a famous historic waterway, was reopened for navigation. It extends from the village of Deep Creek, Va., to South Mills, N. C., a distance of 22 miles; and is one of the most important links in the chain of inland waterways extending along the coast from New York to Florida. A marked advantage of the restored canal is that it enables shipping to avoid the dangers of Cape Hatteras; another is that it will furnish the means of inland and protected navigation for the smaller vessels of the navy and the revenue service. Although only 22 miles long it opens up 2,500 miles of inland navigation. The improvement of this canal cost the United States government nearly $1,000,000. Little Dismal and several smaller swamps are along the coast of North Carolina; area, about 2,000,000 acres.

Dismas, Saint, according to ancient legends, based on doubtful authority, the name of the penitent thief who died on the cross beside Jesus Christ.

Dispart', the difference between the semidiameter of the base ring at the breech of a gun and that of the ring at the swell of the muzzle. On account of the dispart the line of aim makes a small angle with the axis, so that the elevation of the latter above the horizon is greater than that of the line of aim. In modern guns the dispart is of little practical consequence on account of the present placing of the sights.

Dispen'sary is literally a place where medicine or food is weighed out for distribution; in our own day the term is applied to a charitable institution where medical and surgical aid are given without charge to those who desire or need them. Such dispensaries are found in most large towns of the United States and Europe. In the Old World they originated in the monasteries. The Royal General Dispensary, Bartholomew Close, London, is the oldest dispensary in England and was founded in 1770. The oldest in the United States was opened in New York in 1795.

Dispensa'tion, in canon law, is the relaxation of a law in a particular case: it is an act for which the lawgiver is competent as regards laws enacted by himself or by his predecessors to whose powers he succeeds. It is claimed for the Supreme Pontiff that he can dispense in matters where the *jus divinum* springs from a human act of will, as in vows and promissory oaths (Liguori): in such case casuists hold that the Pope does not do away with the *jus divinum* but removes the ground of the obligation of oath or vow: in the words of Aquinas, "He determines what is pleasing to God." The claim of power in the Pope to do this rests on the power granted to St. Peter, of loosing and binding. Bishops by their ordinary power can dispense from the laws and statutes of their own diocese, and from general laws of the Church by virtue of powers delegated by the Pope, as in most vows and in the laws relating to fasts, abstinences, observance of holidays, etc.

Dispen'satory, a work of reference, concerning itself more particularly with the subject of materia medica and therapeutics. Dispensatories are not official volumes, such as pharmacopœias. They represent solely the opinions of scholars who are hired by publishers to issue at more or less regular intervals such works of reference. They are usually encyclopædic in character. At the present time there are two recognized dispensatories widely in use in the United States, the 'National Dispensatory' and the 'United States Dispensatory.'

Dispenser, dĕ-spĕn'sẽr, **Hugh le,** English jurist: b. about 1210; d. Evesham 4 Aug. 1265. He was justiciar of England in 1261 and during the war of the barons with Henry III. joined the former. He was killed at the battle of Evesham.

Disper'sion, an optical term applied to the angular separation experienced by the component rays of a pencil of light on emerging from a refracting medium, whose surfaces are not

parallel to each other, as in the case of the common prism. The refractive index of a transparent medium is different for different kinds of light. Thus, when white light passes through a given prism, the rays of different refrangibility of which it is composed are bent by different amounts from their original common direction. They are said to be dispersed. The dispersion for the given prism depends upon the difference of the refractive indices of the extreme rays of the visible spectrum. It varies with the substance and the angle of the prism. The relative breadth of any two parts of the spectrum varies with the substance of the prism. This constitutes the so-called irrationality of dispersion. In general, rays of short wave-length are more refracted than rays of long wave-length, but in some refracting media this law breaks down in part. This is known as anomalous dispersion. The term false dispersion is applied to the scattering of light by reflection from motes suspended in a transparent medium. See LIGHT.

Displayed, a heraldic term used to describe the position of an eagle or other bird with its wings expanded.

Dispossess, in law, to put out of possession, to dislodge and evict; to deprive of actual occupancy, particularly of real property. Dispossess *proceedings* are begun against a tenant who is then served with a dispossess *warrant*, and ejectment from the premises follows. See EJECTMENT AND EVICTION.

Disraeli, dĭz-rā'lĭ, **Benjamin.** See BEACONSFIELD.

D'Israeli, Isaac, English author: b. Enfield, Middlesex, May 1766; d. Buckinghamshire 19 Jan. 1848. His father, Benjamin D'Israeli, was the descendant of a family of Spanish Jews which had settled at Venice in the 15th century to escape the persecutions of the Inquisition. In 1791–3 appeared his 'Curiosities of Literature,' the most entertaining of his works, and that by which he is best known at the present day. Its success was such as to determine D'Israeli to pursue the same path through the literary field, the collection of instructive and amusing gossip relative to literary men and their writings. From this period up to 1812 he appears to have been principally engaged in the collection and preparation of literary materials, the results of his labors appearing in the following works, published between that year and 1822: 'Calamities of Authors'; 'Quarrels of Authors, or Memoirs of Literary Controversy'; and 'Inquiry into the Literary and Political Character of James I.' These were afterward published collectively under the title of 'Miscellanies of Literature.' In 1828 appeared the commencement of his 'Life and Reign of Charles I.,' a work completed in 1831. In 1841 appeared his 'Amenities of Literature.' D'Israeli was a man of a pensive and solitary turn of mind, and his life was quite that of a literary recluse, spending the greater part of his time in his library. A memoir of him, prefixed to a new edition of his 'Curiosities of Literature,' was published by his son, Benjamin Disraeli, afterward Earl of Beaconsfield (q.v.).

Disruption, the name commonly applied in Scotland to the act by which, in 1843, about 400 ministers gave up their livings to vindicate principles which they held to be essential to the purity of the Church, and in harmony with its earlier history. They held themselves at liberty to return when the Church which they had left had abandoned the opinions on civil and ecclesiastical government which had caused the rupture. See FREE CHURCH.

Dissection, the process of studying the parts or organs of animals or plants by cutting or tearing operations. Practically, no complete knowledge of the structure of organized bodies can be obtained in any other way than by complete dissection, and in human anatomy its place in the curriculum is most important. The dissection of human bodies in the study of anatomy has probably taken place as long as we know the history of civilization; although, in certain countries and at certain ages, the practice of human dissection has been forbidden by certain ruling classes, — at one time the Church, another time the state, another time the aristocrat, at another time public opinion. At the present time, however, dissection of the dead body is recognized to be a prime essential to the study of medicine, and throughout all civilized countries it is widely practised.

Dissection Wounds, wounds made by cutting instruments, during the process of dissection, which differ from ordinary wounds of accidental origin, largely in their greater liability to become infected by pus-producing bacteria. The human body after death makes an excellent host for a number of these septic organisms, notably the staphylococci and streptococci. It is by the entrance of these usually present organisms into the wounds that this ready infection takes place. Often dissection wounds prove fatal by the extension of the infection, with resulting blood poisoning. Great care should be taken by all students of anatomy as well as by undertakers and their assistants in order to avoid accidents of this kind. See BLOOD POISONING; PYÆMIA.

Disseizin, dĭs-sē'zĭn, or **Disseisin** (Fr. *dessaisir*, to disseize, deprive of), is the dispossessing one of a freehold estate, or interrupting his seizin. Under the feudal law, when a vassal was admitted to an estate by the ceremony of investiture, he was said to be seized of it. The disseizing of him was the turning him out of his fee. This term is synonymous, in modern law, with «adverse possession.» There is also what is called in law disseizin by election, when a property holder chooses to consider himself disseized of certain real estate, in order to avail himself of remedies at law applicable only to a disseizee.

Dissenters, the common name by which in Great Britain all Christian denominations, excepting that of the Established Churches, are usually designated, though in acts of Parliament it generally includes only Protestant dissenters, Roman Catholics being referred to under their specific name. The most important bodies of English dissenters are the different bodies of Methodists, the Congregationalists, and the Baptists; and of Scotch dissenters, the United Free Church. The term nonconformists is often used as synonymous with dissenters. For its historical significance, see NONCONFORMISTS.

Dissep'iment, a division of the ovary; a true dissepiment is formed when the carpels are

so united that the edges of each of the contiguous ones by their union form a septum. Each dissepiment is formed by a double wall of two laminæ: when the carpels are placed side by side, true dissepiments must be vertical and not horizontal. A spurious or false dissepiment is formed when the divisions are not joined by the union of the edges of contiguous carpels. They are often horizontal, and are then called phragmata. In the Cruciferæ they are vertical.

Dissociation, in chemistry, is the resolution of a substance into other substances, whose molecules have a simpler constitution; but the word is usually applied only to those reversible resolutions in which the secondary products are capable of recombining to form the primitive substance, when the conditions that led to the dissociation are removed or reversed. Dissociation is therefore to be contrasted with "decomposition," for the latter word is used without any implication as to the subsequent behavior of the products into which the primitive substance is resolved. Dissociation, in the usual sense of the word, is induced directly by the application of heat, and many cases of it have been exhaustively studied. Calcium carbonate may be taken as an example. When this substance is heated in a closed vessel it parts with a portion of its carbon dioxide and becomes reduced to a mixture of calcium oxide, calcium carbonate, and free carbon dioxide gas. The decomposition proceeds only up to a certain limit, however, and if (as in "burning" limestone for the production of quicklime) it is desired to reduce the carbonate of calcium entirely to the form of the oxide, it is necessary to provide for the removal of the carbon dioxide gas. If the operation be carried out in a strong closed vessel which contains nothing but calcium carbonate, calcium oxide, and carbon dioxide, the decomposition proceeds only until the liberated carbon dioxide attains a definite pressure called the pressure of dissociation, which is always the same for the same temperature, and bears no relation to the quantity of calcium carbonate that is present, provided some quantity of it (no matter how little) still remains. Sir James Hall showed, many years ago, that when calcium carbonate is confined in this way it may even be fused without undergoing decomposition to any considerable extent. The explanation of these curious facts is, that the carbon dioxide is continually combining with the calcium oxide in certain parts of the vessel with the production of calcium carbonate, while in other parts of the vessel the calcium carbonate is simultaneously dissociating into free calcium oxide and free carbon dioxide. The recombination proceeds with a velocity that is proportional to the density of the free gas, while the dissociation proceeds with a velocity which, for the purpose of illustration at all events, may be regarded as constant. It follows that at low densities of the gas the dissociation will proceed faster than the recombination, the result being that the density of the free gas will increase. But this will also cause the recombination to proceed faster, and finally, when the density of the gas reaches a certain critical value, the recombination and dissociation will proceed with equal velocity, and a state of apparent equilibrium will be attained. No further visible decomposition of the carbonate will take place, unless the equilibrium is disturbed by the removal of some of the carbon dioxide (in which case the dissociation will again proceed until the same critical density of the free gas is restored), or by a further increase of temperature (in which case the dissociation will proceed until the density of the gas attains to a new critical value, higher than the first one, and whose value depends upon nothing but the new temperature to which the system has been raised). Reactions such as the one here described thoroughly refute the old doctrines of chemical affinity, which taught that two substances either will or will not combine under given circumstances, according as the chemical "affinities" of the constituent elements would be more or less thoroughly "satisfied" in the possible new compound than they are in the separate substances that might combine to produce that compound. In the case considered above, combination and decomposition go on simultaneously, and the only question is, which of the two will proceed the faster under given conditions. (See EQUILIBRIUM, CHEMICAL.) The quantitative study of the phenomena of dissociation is beset with difficulties, for the extent of the dissociation cannot be ascertained with satisfactory precision in all cases. The products into which the primitive substance is resolved are (by the definition of dissociation) capable of recombining when the conditions that lead to the dissociation are removed. Hence it is by no means easy to determine what proportion of a compound is dissociated under given circumstances. When (as in the case of calcium carbonate) the primitive substance and one dissociation product are solid, and the other dissociation product is gaseous, the extent of the dissociation may be inferred by computing the mass of the free gas, from observations of its volume, pressure, and temperature. When the original substance and the products of dissociation are all gaseous, the problem becomes exceedingly difficult, and special means must be devised to fit each special case. In the case of nitrogen tetroxide, N_2O_4, which dissociates into the oxide NO_2, the degree of dissociation may be inferred optically, since N_2O_4 is nearly colorless, while NO_2 has a pronounced brownish-red color. In other cases, the extent of the dissociation may be inferred from observations of the vapor density of the mixture. This method has been used quite successfully in the case of iodine, the vapor density of this element indicating a molecular formula of I_2 at temperatures below 700° C., and I at temperatures above 1,500° C.; while at intermediate temperatures the vapor is a mixture of I and I_2. The dissociation of acetic acid vapor has been studied by the vapor density method, and also by observing the specific heat of the mixture at different temperatures, the specific heat being assumed to be greater (on account of the work done in separating the molecules) as the dissociation proceeds than it is before the dissociation begins, or after it is complete.

Certain compounds (such as sodium chloride) appear to be more or less completely dissociated when they are dissolved in water; but the constituents into which they are resolved possess certain distinctive properties that are not manifested by the resolved parts of substances that are dissociated by the action of heat. For this reason it is now usual to dis-

tinguish this particular phenomenon by a special name, and the dissociation that occurs in such cases is called "ionization." See ELECTROLYSIS; SOLUTION.

Dissolution, the resolution of any body into its smallest parts by chemical agency. In English politics, the act of dissolving or putting an end to the existence of a Parliament. It differs from a prorogation, which is the continuance of a Parliament from one session to another, and from an adjournment, which is its continuance from one day to another. A dissolution is the civil death of a Parliament; and this may be effected in three ways: (1) By the will of the sovereign. (2) By the demise of the crown. This dissolution formerly happened immediately upon the death of the reigning sovereign, but it being found inconvenient to call together a new Parliament immediately on the inauguration of the successor, and dangers being apprehended from having no Parliament in being in cases of a disputed succession, it is provided by several statutes that the Parliament in being shall continue for six months after the death of any sovereign, unless sooner prorogued or dissolved by the successor. (3) A Parliament may be dissolved or expire by length of time. As the constitution now stands the Parliament must expire, or die a natural death, at the end of every seventh year, if not sooner dissolved by the royal prerogative.

Dissolving Views, paintings upon glass magnified and thrown with great distinctness upon a screen by means of one or two magic lanterns with strong lenses, and illuminated by the oxyhydrogen light. If one lantern is used the picture is drawn out of focus gradually, and a second substituted, which is brought gradually into focus, thus producing the haze and brilliancy which have gained this sort of exhibition its name. If two lanterns are used, they are placed side by side with their lens tubes slightly convergent, so that the images may be superposed on the screen. An opaque rectangular shutter, capable of revolving vertically upon a pivot fixed midway between the lanterns, is placed before the lenses in such a position that, when horizontal, it cuts off one half of the pencil of light from each lens. When this shutter is made to revolve through a small arc, it shuts off the whole of the pencil of light from lantern No. 1, allowing that from No. 2 to pass unhindered. When the shutter is in this position the image from No. 2 falls on the screen in full distinctness; but when the shutter is made to revolve in the opposite direction, the image from No. 1 will be gradually disclosed, as that of No. 2 becomes concealed.

Dis'sonance (Lat. *dissonantia* — *dissonare*, to sound harshly). A word in music wrongly supposed by the general public to mean the same as discord (q.v.). Technically, it is a sound of two or more tones struck together which are at variance with the formation of a common major or minor chord. Thus it is an interval, one or both of whose members must move in a certain way to satisfy the ear — demanding resolution into consonance (q.v.). If the dissonance is minor or major one member only is compelled to move. If augmented or diminished both members must move, toward each other if the interval is diminished, and contrary if augmented. All augmented and diminished intervals, seconds, sevenths, and ninths are dissonances. Dissonance, however, disregards all limitations, and it is next to impossible to form rules to govern it. In recent years especially, it seems to have become a law unto itself, and appears reaching out for a new science of sound outside of natural harmony. As witnessed in the work of the new school of composers, with such men as Richard Strauss and Edward Elgar for leading exponents, it wields a new and strange power which may revolutionize the tonal world. To demonstrate the progress of dissonance in modern music it is only necessary to cite the very important part the "fifth" plays to-day even in compositions of conservative musicians. Thirty years ago this interval ("fifth") was abhorred by theorists and looked upon as an abomination. See ACOUSTICS; CHORD.

Dis'taff, the earliest instrument of spinning, a staff, on one end of which the wool or flax was rolled. The spinner held it in the left hand, and drew out the fibres with the right, at the same time twisting them. A spindle was attached to the thread, the weight of which carried down the thread as it was spun. When the spindle reached the ground the thread which was wound round it was then again fastened near the beginning of the new thread. The 7th of January is called St. Distaff's Day, because it marks the return of the women to their usual household duties, after the revels of Twelfth Day.

Distem'per, a disease of the dog commonly considered as of a catarrhal nature. In most cases a running from the nose and eyes is one of the first and chief symptoms. This defluxion becomes after some time mucous and purulent, loading the eyes and obstructing the nostrils; and whenever the animal is subjected to a draught of air, or excitement of any kind, it has violent fits of coughing combined with vomiting, it soon begins to lose appetite, its flesh begins to waste, and it becomes listless and irritable. If the disease be virulent, symptoms of affection of the brain manifest themselves, accompanied by fits, which come on especially at the sight of another dog, or by convulsive twitchings, resembling St. Vitus' dance. In such cases the dog is often supposed to be mad, and frequently destroyed in consequence. Inflammation of the lungs is not an infrequent consequence of the disorder, and the bowels are more or less affected by diarrhœa and dysenteric discharges. Protracted cases are attended by eruptions on the chest and abdomen, and the surface of the body becomes of a yellow hue. These are always fatal symptoms. In the first stage of the disease laxatives, emetics, and occasional bleeding are the principal remedies; diarrhœa should be checked by astringents, and to reduce the violence of the fits warm bathing and antispasmodics should be resorted to.

Distemper (from O. Fr. *destemprer*, Mod. Fr. *détrempe*, Ital. *tempera*), in painting, a preparation of opaque color mixed in a watery glue, such as size, white of egg, or glue. It is used now chiefly in scene painting and in paper for walls, but was employed in the higher departments of art before the establishment of oil or varnish painting in the 15th century.

Distich, dĭs'tĭk, a couple of verses making complete sense; a couplet composed of different kinds of verse, repeated in the same order.

Distillation is a technical process which results in the separation of a volatile from non- or less volatile components contained in a closed vessel (still, pot or retort), and their conversion, by the application of heat, into vapors, and subsequent condensation to the liquid state. The liquid obtained by distillation is called the distillate, and the remainder is the so-called distillation residue. When water is heated to 100° C. (212° F.), at ordinary atmospheric pressure, it boils and is converted into steam. If this generated steam is conducted through a pipe, around which cold water flows, it will again be transformed to a liquid. In the distillatory apparatus this appliance is called the condenser. The obtained liquid is collected drop by drop in a receiver. The entire process is called distillation, from the Latin word *destillare*, meaning "to drop." Accordingly the essential features in a simple distillatory apparatus are:

1. The still, pot, or retort, that is, the receptacle for the material to be distilled. In accordance with its nature, this material is heated to that temperature at which the products are volatilized.

2. The condenser, by means of which the distillates are condensed.

3. The receiver, which collects the products of distillation in a liquid state.

When distillation is properly conducted, many liquids, as for instance, water, can be purified.

Distillation of Water.— Pure water is never found in nature, as it generally contains salts and other mineral substances, organic matter, and decomposition products, partly volatile, and partly non-volatile. The non-volatile components are readily separated by distillation. Inasmuch as the former are mostly very volatile, they are received in the very first distillate of the water, so that it is customary to reject this first portion. Experience has taught that pure water is obtained by distilling three fifths of the entire amount, and rejecting the first one fifth. In some special cases, where a water has many volatile impurities which can be detected by its appearance, odor, and taste, the distillation might be rendered more difficult, as it becomes necessary to add certain chemicals to the water in order to combine the volatile components and to transform them into non-volatile bodies. The purifying of water by means of distillation, or, in other words, the preparation of distilled water, is of much practical value. In the pharmacy, in the chemical laboratory, and in many chemical industries, distilled water is an indispensable article. The transformation of the salt water of the ocean into a potable water, by means of distillation, is also of inestimable value. Pure distilled water, however, has an empyreumatic odor, and a repulsive flat taste. According to the most recent medical investigations, pure distilled water, when constantly used, is, on account of its very purity, deleterious to health. It is claimed that this water possesses high solvent properties and also absterges the mucous membrane of the stomach too much. For this reason, the odor of the water is improved by thorough aëration or carbonization, and it is made potable by the addition of pure salt or sugar, or any other desired substance. The large ocean steamers have an equipment for producing a potable water from the sea water. The fundamental elements in this apparatus are a steam generator or evaporator, in which the sea water is vaporized by means of superheated steam, which is obtained either from a special boiler or directly from the engine boilers; a condenser combined with an aërator; and a refrigerator, with which, in many cases, a filter is combined. Special constructions of this style are those of Chaplin, Rocher, Dr. Normandy, Gallé, Mazeline, Perroy, and Hocking, in which simplicity of construction and the economy of coal are the main essentials. In recent times many ships supply themselves with an especially good well water for drinking purposes, while for cooking, washing, and boiler feeding, they distil the sea water as it is required. For these latter purposes carbonating and aërating are of course unnecessary. In most cases the evaporator is directly connected with the ship's engine. The sea water which is to be evaporated is taken from the water cooling the condenser, while the steam is obtained from the steam-jacket, or an intermediate compartment of the engine. In this way, the cylinder is constantly drained and supplied with fresh steam. The most common of these constructions are those of Yarian, Pape & Henneberg, Howe & Beckwith, Pamphlet & Ferguson. The distil constructed by Jones utilizes the escaping gases for heating the water, so that the entire apparatus is situated in the chimney. In general, the distillation of water is very simple, because it is a liquid which has a constant boiling point. More heat in the distillation process simply occasions more rapid evaporation. The departing steam, unless it is heated in a special apparatus, as is done in the case of superheated steam, retains the boiling point temperature until it is cooled.

However, it is different with a mixture of various vaporizable liquids, each of which has a definite boiling point. According to the predominance of one or the other liquid, the mixture will have a varying boiling point. When the vapors passing over at different intervals are separately condensed, it is possible to obtain single components from the mixture, provided, of course, that the various components of the mixture radically differ in their boiling points. This special method of distillation is called fractional distillation.

The best-known distillation process is the separation of water and alcohol, or, in other words, the concentration or rectifying of alcoholic solutions, by means of distillation. This is a special branch of modern industry and is also a valuable source of revenue to the State.

Distillation of Spirits.— The boiling points of water and alcohol differ considerably. At normal pressure water boils at 100° C. (212° F.), while alcohol boils at 78.4° C. (173.5° F.). Consequently, it is evident that the boiling point of a mixture of water and alcohol will range between 173.5° F. and 212° F. In proportion to the predominance of alcohol, the boiling point will be lower, and as the alcohol vaporizes, the boiling point will rise until, finally, pure water is distilled at 212° F. If a dilute mixture of water and alcohol [the mash in the American distillery usually contains 5 to 10 per cent alcohol by volume (10 to 20 proof)] is distilled in a simple distilling apparatus consisting of a pot,

or still, and a worm, dilute alcohol is always obtained, and the smaller the quantity of alcohol contained in the mixture, the greater proportionately will be the amount of alcohol contained in the distillate, as is shown in the following table of Groening:

Percentage of alcohol in the boiling mixture		Boiling point		Percentage of alcohol in the vapor	
Volume	proof	Centigrade	Fahrenheit	Volume	proof
1	2	98.75	209.7	13	26
3	6	96.25	205.2	36	72
5	10	95.0	203.0	42	84
7	14	93.75	200.7	50	100
10	20	92.50	198.5	55	110
20	40	87.5	189.5	71	142
30	60	85.0	185.0	78	156
40	80	83.75	182.7	82	164
50	100	82.5	180.5	85	170
60	120	81.25	178.2	87	174
70	140	80.00	176.0	89	178
80	160	79.38	175.2	90.5	181
90	180	78.75	173.7	92	184

If the distillate obtained from a dilute mixture of water and alcohol is redistilled, a distillate containing more alcohol is obtained. Thus in four distillations of a mash having 10 per cent alcohol by volume (20 proof), a raw spirit 80 per cent alcohol by volume (160 proof) is obtained, in which the

first distillate contains 28 per cent alcohol by volume, 56 proof
second distillate contains 50 per cent alcohol by volume, 100 proof.
third distillate contains 70 per cent alcohol by volume 140 proof.
fourth distillate contains 80 per cent alcohol by volume, 160 proof.

Of course, we assume that each time the distillation is carried out completely.

Formerly, it was necessary to repeat the distillation several times, in order to obtain a highly concentrated alcohol. The first weak distillate with less than 20 per cent alcohol by volume was called Lutter. It was used for the further concentration of the alcohol. This method of concentrating alcohol was called doubling or rectification, but as this repetition was tedious and consumed much time and fuel, a shortening of the distillation process was eagerly sought for, and with the aid of suitable appliances it has now become possible to introduce a complex, separatory distillation in one operation.

The following principle is standard for the construction of distillatory apparatus. If the concentrated alcoholic vapors developed at the boiling of the alcohol-water mixture are not cooled directly to the temperature of condensation, but only a few degrees, then a greater part of the less volatile liquid, that is, water, is condensed than of the more volatile alcohol. Through this partial cooling, the remaining vapor accumulates more alcohol. This process is called dephlegmation and denotes a draining of the alcohol, as the older chemists designated the water as a component of spirit by the word "phlegma." Accordingly, the more recent apparatus in larger distilleries, in which highly concentrated alcohols are manufactured, are equipped with a dephlegmation and rectification appliance, in direct connection with the still, so that it has become possible in the column apparatus of to-day, with continual operation, to produce, from the fermented mash, a high wine free from fusel, containing 90 to 95 per cent alcohol by volume (180–190 proof).

According to the capacity of the plant, and, especially according to the kind of product, various apparatus are used in the distillery; but an enumeration here of these would lead too far, while their description properly belongs under special heads. Therefore only the main types of various distillatory apparatus are mentioned here:

1. Simple stills, with worm condenser heated by direct firing.

2. Simple stills, with closed washwarmers, in which the mash is previously heated by the latent heat of vaporization.

3. Double pot-stills, generally consisting of two superimposed stills. While the mash in the lower still is being deprived of its alcohol, the mash in the upper still is enriched with alcohol and heated by the vapors of the lower mash, until the latter after sufficient concentration is heated to the boiling point. From this time on alcoholic vapors develop in the upper pot which are cooled in a dephlegmator and absorb still more alcohol. The concentrated vapors pass over into the condenser, while the condensed liquid flows back into the upper still. Such apparatus are either heated by direct firing below the lower still, or by means of steam, which is introduced into the lower still.

4. Two, three, or more chamber charge-stills, with or without charging chamber in one apparatus, in which the single compartments are placed one over the other, and the heat from the lower serves to enrich the one above. Steam is used for heating.

All these apparatus, when heated by direct firing, are made either of copper or iron, when heated with steam are made of copper, but oftentimes made of wood, such as heavy cypress or white oak. These are more suitable for intermittent working, and are mostly used in distilleries which distil rye, whiskey, etc.

5. Continuous pure still apparatus (on account of their form called column apparatus), which are mainly used in larger distilleries, can be regarded as a combination of a larger number of small stills, in which the mash, continuously flowing from the upper compartments to the lower, constantly comes in contact with steam flowing in the opposite direction. Through this countercurrent, the rising vapors become more rich in alcohol, through the dephlegmation and rectification taking place in each of the compartments, while the mash flowing downward is constantly deprived of its alcohol until it flows from the lowest chamber as slop, free

from alcohol. The concentrated alcoholic vapors, escaping from the uppermost chamber of the column, are then liquefied in a condenser when alcohols of only moderate strength (125 to 150 proof) are to be produced; but, if very pure highly concentrated alcohols are to be manufactured, these vapors pass over into a similarly constructed rectification column, where they meet with the liquids (lutter or phlegma), returning from the dephlegmator or condenser. The vapors take up alcohol from the liquids and pass from the upper chamber of the rectifier into the dephlegmator, in which a continual countercurrent between the condensed liquids constantly takes place.

These continual apparatus are improvements of the apparatus of Coffey, which are much used in England and Scotland; Savalle, an improvement of which is used in France; of Pistorius, Ilges, Siemens, Bohm, and others. The advantages of the continual column apparatus in comparison with the simple pot-stills, are, that the mash is more quickly vaporized, that the expense for fuel is diminished and that, as a rule, a more highly concentrated product is obtained. But, on the other hand, they also require more care and attention and skilled operators. They are also more difficult to construct (therefore it is advisable to place an order with a first-class reliable firm). Besides there is a possibility that alcohol might sometimes pass off with the slop. In the simple stills this possibility is considerably reduced, so that it is still advisable for small distilleries to erect good pot-stills, because they mostly manufacture alcoholic liquors with about 50 per cent alcohol by volume (100 proof).

The alcoholic liquid obtained in the distillery with the best modern apparatus contains, besides the highly concentrated alcohol (96 per cent by volume, 192 proof), more or less fusel oil, by which the admixture of various substances besides water is meant. Up to the present time, the following impurities contained in 50 to 95 per cent alcohol by volume have been determined; acetic aldehyde, propylic alcohol, isopropylic alcohol, butylic alcohol, acetic ether, butylic ether, acetal, secondary amylic alcohol, isoamylic alcohol, isobutylic alcohol, furfurol, and various amines. In the corn and potato spirits amylic alcohol is in predominance, and therefore it is briefly called fusel oil. Technically, fusel oil is not a uniform substance, but the higher boiling part of the impurities accompanying the alcohol distillation.

Very little is known about the origin of these substances. Their presence might be due to secondary fermentations which are produced by fission fungi, schizomycetes, but the yeast itself may also have a certain influence, as certain yeast species are capable of producing fermentation products of a definite aroma and taste. For example: *Saccharomyces ellipsoideus* produces a peculiar fruit bouquet. It is well known that aging or decaying yeast furnishes a more impure product than a sound and vigorous yeast. The raw material used in the distillery must also be considered. The corn, rye, and potato fusel oil differ in composition, so that through experience one is enabled to detect the materials used, by the odor of the raw spirit. The fusel oil of the rye spirit contains, besides amylic alcohol, aromatic œnanthic ether; the molasses spirit contains the ethers of caproic acid, capric acid, caprilic acid, etc., which are very similar to the so-called oil of wine. Finally, the construction of the distillatory apparatus also influences the quality of the product. High pressure and too long a sojourn of the alcoholic vapors in the rectificator or dephlegmator are also said to be detrimental.

As it is necessary for some industries to use pure alcohol, these impurities are generally removed by either of two processes: (1) Filtration of the raw spirit through charcoal; (2) refining, by fractional distillation, or, in some cases, a combination of both.

In the manufacture of brandies, the former method is generally and successfully used, as a trace of impurity gives the brandy its characteristic aroma and taste. Finely powdered charcoal made from soft wood or bark served as the filtering medium. It is well known that charcoal, by virtue of its absorbing capacity, serves as a decolorizer and deodorant, and in order to effect thorough absorption, the spirit must be diluted to about 40 per cent by volume (80 proof). In smaller plants the filter consists of a vat packed with charcoal. The larger distilleries and refineries use a battery of iron cylinders packed with granular or powdered charcoal. Steam is conducted into the battery until the charcoal is thoroughly saturated; then the spirits flow in, displacing the steam and filling the pores of the charcoal. The larger part of the impurities is absorbed in the lower cylinder, while the remaining impurities are removed during the passage through the remaining cylinders. If a filter is ineffective, it is cut out, the spirit is drawn off, steam is introduced, which forces the distillate into the condenser. This distillate constitutes the so-called "feints." The feints is a dilute spirit, which is milky in appearance on account of the presence of fusel oil. After standing, the fusel separates and can then be utilized, while the alcoholic liquid is worked up anew. The emptied filtering cylinder is repacked with charcoal and used as the last filter. The used charcoal is either ignited in a special furnace, or else purified by means of superheated steam.

Refining of Spirits.— In order to produce an entirely fusel-free and highly concentrated alcohol, which is used for blending wine, cognac, etc., as well as for scientific and certain technical purposes, the filtered alcohol must undergo a fractional distillation. It is essential that the alcohol, whether filtered or not, be diluted to about 40 to 50 per cent by volume (50 to 100 proof).

The rectificator for refining in general is the same as the distilling apparatus, but, inasmuch as the operation is a fractional one, it is an intermittent one. The columns are equipped with caps, bells, or sieves.

Through distillation we receive:

1. The first runnings or fore-shot. This is the first distillate which contains those impurities of the alcohol which vaporize below the boiling point of the latter. Among these impurities acetic aldehyde is especially predominant.

2. Rectified fine spirit, which is divided into several distinct products, of which the first still contains some substances vaporizable at a low temperature, and the intermediate products are pure alcohol, while the last portions already contain substances which volatilize at temperatures above the boiling point of alcohol. All

of these products are separately collected at different intervals and furnish

(*a*) Wine spirit, commercially known as Cologne spirit. It contains 96 per cent of alcohol by volume (192 proof).

(*b*) Prime spirit, which is technically absolute alcohol. For medicinal purposes it meets the requirements of the alcohol deodoratum of the United States Pharmacopeia. It contains 94 to 95 per cent alcohol by volume (188 to 190 proof).

(*c*) Common spirit or high wine, commercially called "rectified spirit." It is used for blending wine and cognac, for medicinal and all other purposes when a pure, fusel-free, less concentrated alcohol than the foregoing is necessary. It contains about 90 per cent by volume (180 proof).

(*d*) Alcohol of about 88 per cent by volume (176 proof), which can be used for blending brandies as well as for preparing dilute alcohol (97 to 100 proof).

(*e*) Weaker alcohols, which are usually redistilled with the raw spirit.

(*f*) The so-called last runnings or feints, which usually contain amylic alcohol, are used in various industries, as for example, in the textile industries, on account of their solvent power over fats and oils; in the manufacture of ethereal oil and also in the chemical laboratory.

By means of filtration and fractional distillation, about 85 to 90 per cent of the raw spirit are obtained as rectified spirit, therefore it has been the object of many experiments to improve this yield.

The attempt was made to remove the fusel, by using, in place of charcoal, either soap, oil, or fatty substances. It was believed that these substances would retain the fusel. Besides these, chemical agents as soda, lime, sulphuric acid, acetic acid, nitric acid, chloride of lime (bleaching powder), the peroxides of hydrogen, lead, manganese, etc., which were to destroy the fusel, were used. Most of these agents either act only upon certain components of the fusel, while the higher alcohols remain unchanged, or else the ethyl-alcohol was more energetically attacked than the impurities.

According to "Eisenmann's patent," the fusel could be removed by means of ozonated air, but no more practical results were achieved by this process than by that patented by Bang & Rufin. At one time this latter method received much attention, as it was claimed that if the raw spirit was treated with kerosene, it would give off all its impurities to the latter.

The only successful defuselizing process is that of Traube, by which a sufficiently concentrated potash solution is mixed with the spirit in accordance with its strength, and heated to 60 to 70° C. (140 to 148° F.). Two layers are formed, the upper, which is dark-colored and foul-smelling, contains the impurities, and in the lower we find the purified alcohol with the salt solution. After removing the former, the latter is distilled in a rectificator and concentrated; 97 to 98 per cent of the raw spirit are secured by this process.

But after all, filtration through charcoal is the best practical refining process for brandies, while filtration and fractional distillation are best employed for Cologne spirits. In large distilleries the manufacture of Cologne spirit and rectified alcohol directly from the mash is both practically and technically the most advantageous when manufactured in apparatus based on Ilges' system. American coppersmiths manufacture an excellently constructed apparatus of this type. In ordinary distillation and refining, a deterioration of the material takes place, as the fermentation products of the normal mash are purer than those of the raw spirit. The presence of atmospheric air in the condenser induces the formation of aldehydes, and, in the raw spirit, foul-smelling substances. By means of slow evaporization in the rectifier fusel oil is decomposed, while in the new automatic spirit apparatus, it is obtained as fusel oil. These apparatus are equipped with very effective dephlegmators and rectificators, so that it is an easy matter to precipitate the fusel from the alcoholic vapors and to receive only the purest alcoholic vapor in the condenser. In order to prevent an accumulation of fusel in the ever-returning phlegma temperature regulators and fusel separators are attached in the latter, so that the phlegma constantly has a uniform temperature and fusel can never be in excess. The advantages of this process are not only the dispensing with rectification and filtration, but also the production of a pure valuable spirit of about 95 per cent alcohol by volume (190 proof), while the valuable and untaxed fusel is obtained as a by-product. In addition, the yield is greater, as the loss caused by rectification is avoided.

Absolute anhydrous pure alcohol cannot be made in this way, nor can it be prepared by repeated distillation, as alcohol is in itself hygroscopic and tenaciously holds on to the last traces (3 to 4 per cent) of water. This last remnant of water can only be removed by very effective dehydrating agents; as for example, freshly burned lime, anhydrous carbonate of potash, anhydrous white copper sulphate, fused calcium chloride, and especially metallic sodium. By distillation over any of these substances the water is absorbed and an absolutely anhydrous pure alcohol is produced. This process is, however, only carried out in chemical laboratories, and as a precautionary measure this alcohol is stored in small bottles with any of the above substances. This precaution is taken in order to prevent the absorption of moisture by the alcohol.

The distillation of alcohol, as in many other distillatory operations, is merely a mechanical process of purification, as no chemical change takes place, because the distillates have the same chemical composition as the original substance. Distillation is only a mechanical separation of the secondary ingredients from the principal one. Some substances, as for instance, glycerine, when distilled in presence of atmospheric air, will decompose. In such cases the distillation is done in a partial vacuum. By means of an air-pump air is withdrawn, until the boiling point is lowered to that degree at which the distillation can take place without decomposition. It is well known that matter will boil at a lower temperature, when the pressure is decreased; and that decomposition is less liable to occur. Again, other substances cannot be distilled in the presence of much oxygen, so that carbonic acid, hydrogen, or other gases are forced into the still. These gases pass over with the vapors of distillation. This process is called the distillation in an atmosphere of an indifferent gas.

Another important distillation is the so-called dry distillation, in which organic substances are decomposed into solid, fluid, and gaseous products by means of high temperatures and with the exclusion of air. As a rule these products, called empyreumatical, are formed simultaneously, but are separately collected and treated. An example of dry distillation, which is also called destructive distillation, as it is accompanied by chemical changes, is the distillation of coal for the manufacture of illuminating gas, ammonia-water (in the raw condition, tar-water, which contains cyanides and sulphocyanides in connection with ammonia), semi-fluid, viscous, oily, and very valuable products, as, for example, tar-oil, which is extensively used in the manufacture of aniline colors, antiseptica, and medicinal preparations, are obtained as by-products, while coke is the residue of the coal distillation.

Besides these above-mentioned industries, many others are also based on the distillatory process. Among these are the distillation of wood by which acetic acid, wood alcohol, and wood tar are obtained; the distillation of resins through which turpentine, resin-oils, colophony are obtained; the petroleum industry and many others.

A special branch of distillation is that in which a solid is vaporized and by condensation directly passes from the gaseous to the original solid usually in a crystalline form. This process is called sublimation, and is mostly used to purify volatile solids, as for example, sal-ammonia (chloride of ammonia), benzoic acid, camphor, and indigo. The most interesting part in sublimation is that the solid does not pass through a liquid state, but at once to the gaseous form. The reverse process also takes place in like manner, namely, the condensation from the gaseous state back to the solid condition.

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Distilled Liquors, all the liquids obtained by distillation. It is often customary to consider, in contradistinction to the fermented liquors, wine, beer, cider, vinegar, only those distilled alcoholic liquids which contain about 30 to 50 per cent alcohol by volume (60 to 100 proof), and are consumed as alcoholic beverages or distilled liquors (whiskey, brandy, cognac, rum, arrack, gin, etc.). All the other more highly concentrated alcoholic liquids used in technics, medicine, pharmacy, etc., are called alcoholic spirits. In the distilled liquor beverage, alcohol is always the main ingredient, and the varying aroma and taste, due to the origin and the method of procedure, influence its commercial value. On the other hand, spirits are judged according to their concentration, so that secondary ingredients and aromatic substances deteriorate their value. Hence in the manufacture of spirits everything that is not alcohol is eliminated.

In the United States the concentration of alcohol is determined according to proof-degrees. The regulations of the United States Internal Revenue Office say that "proof spirit shall be held to be that alcoholic liquor which contains one half its volume of alcohol of a specific gravity of 0.7939 at 60° F." Therefore each proof-degree is equivalent to 0.5 volume per cent.

If 100 gallons of liquor contain 48 gallons of absolute, pure alcohol, it is 2 x 48 or 96 proof, and a spirit containing 92 gallons of alcohol per 100 gallons, is one with 92 x 2 or 184 proof. The revenue standard is a liquor with 50 volume per cent (100 proof) of alcohol. "Over" and "under" proof are not officially recognized in the United States, although we find these distinctions given in older books.

The raw materials used in the preparation of alcoholic liquors and spirits are:

1. *Alcoholic liquids*, as wine and its waste and by-products (wine-yeast, grape-cakes), the waste and by-products of the brewing industry, in which the spirit is obtained solely by distillation. The product of the wine distillation is used almost exclusively for cognac and brandy, which are especially manufactured in California and Ohio.

2. *Sugary substances*, as the extracts of the sugar-beet, sugarcane, mainly molasses, and also of sweet fruits (cherries, plums, sweet potato, Jerusalem artichoke, melons, etc.). The sugar must be converted into alcohol prior to distillation.

3. *Starchy substances*, among which we can enumerate the various cereals (barley, barley-malt, corn, rye, wheat, oats, rice, buckwheat, etc.), and also potatoes. Corn, barley, barley-malt, rye, oats, and wheat are mostly used in the United States. Before the alcohol can be obtained, the starch must be transformed into fermentable sugar, which in turn is fermented, previous to distillation.

4. *Fibrous substances*, in which the cellulose is converted into fermentable sugar. The further treatment is the same as above (No. 3). Concentrated mineral acids acting under pressure on cellulose, will cause the formation of fermentable sugar, and since such fibrous substances (peat, sawdust, etc.) are inexpensive, many experiments have been made to obtain a practical method for producing alcohol from such materials. Many such methods have been patented. During the International Chemists' Congress at Berlin, 2–8 June 1903, Simonson, from Christiania, Norway, reported on a process of manufacturing spirit from sawdust and also presented a calculation of the prospective profits, which, however, still lacks the confirmation of actual trial. The manufacture of alcohol from fibre stuff is as yet of theoretical interest, and is therefore merely mentioned here. Likewise is the preparation of

5. *Mineral spirit* of theoretical interest, although it can be prepared in the chemical laboratory. If ethylene (C_2H_4) is conducted into sulphuric acid, ethylsulphuric acid ($C_2H_5HSO_4$) is formed, which if diluted with water will split up into sulphuric acid and alcohol. Ethylene is a gas and is an ingredient of illuminating gas made from coal. It is also easily produced from acetylene (C_2H_2) by nascent hydrogen, according to the formula $C_2H_2 + H_2 = C_2H_4$. Acetylene is cheap, and is most readily obtained by the action of water upon calcium carbide (CaC_2). It is extensively manufactured and copiously used, but undoubtedly these experiments will be perfected in the future.

In accordance with the importance of these various kinds of raw material consumed in the large United States distilleries, we will first

of all discuss the manufactures of liquors and spirits from starchy substances.

These raw materials are treated, as in the brewing industry, with malt (mostly barley malt, sometimes also rye and wheat malt) in such a way that the diastase of the malt converts the starch into dextrin and sugar. But a distiller's malt differs in its properties from a brewer's malt. While the latter must impart its aroma and taste to the beer and only exert its diastatic power in a moderate degree, the former must be characterized by a maximum of diastatic power. Consequently the distiller prefers a malt from a small-kerneled barley, which has been kilned at low temperatures. The diastatic power is weakened by high temperatures. Consequently some distillers, who operate a malting plant in connection with their distillery, use only green malt, or at most, air-dried malt. The German distillers universally use green malt. In contradistinction to the brewer, the distiller prefers a malt made from a barley rich in nitrogenous matter, as this latter furnishes material for the formation of diastase and for the nourishment of the yeast. It is entirely wrong to suppose that a good brewer's malt is also a good malt for distillers. In mashing, the largest possible amount of starch must be converted into fermentable sugar (maltose) in order to obtain as high a yield of alcohol in the distillation as possible. Under the most favorable conditions 96 per cent of the starch in the mash material can be converted into maltose (the remaining 4 per cent are changed into dextrin), while in practice only about 80 to 81 per cent maltose are obtained, and the remainder is dextrin. After the maltose is decomposed into carbonic acid and alcohol, the dextrin is gradually converted by the diastase into maltose and then fermented. This can only be accomplished with vigorous yeast and proper treatment in the fermenting rooms. On account of this "after-effect" the diastase must be carefully guarded, especially by avoiding high mashing-off temperatures, and the formation of lactic acid and particularly butyric acid, produced by certain bacteria at a temperature of 40 to 50° C. (104 to 122° F.).

The mashing process varies according to the kind of product desired, the capacity of equipment (large, or small, or very small, the latter requiring hand power for mashing in place of machinery), the amount and quality of the raw material, and, oftentimes, on the fancy of the customers. Inasmuch as whiskey is the main product of United States distilleries, we will discuss its preparation first of all.

The word "whiskey" is of Celtic origin, for it apparently is an abbreviation of the word "usquebaugh" or "uisgebeatha," which corresponds to the Latin *aqua vitæ* (water of life). According to historical research the word *aqua vitæ* is a corruption, because the original wording for distilled spirit was *aqua de vite* (water from the grape vine). In mediæval times the monks changed this latter form to the one now in general use.

Although the same word is used in America, Ireland, and Scotland, the product is very different. The Irish and Scotch distilleries use almost exclusively kilned malt (only rarely, other cereals), while the American distilleries have an entirely different equipment and also their own characteristic development.

For the manufacture of whiskey, especially corn and rye, sometimes also bran, wheat, and kilned malt (0 to 15 per cent) are used. The best-known brands are:

Bourbon whiskey, in the manufacture of which corn is the main ingredient. According to the quality of the Bourbon, the materials vary as follows:

Brand	Malt	Rye	Corn
	Per cent	Per cent	Per cent
Ordinary Bourbons	10	10	80
Medium Bourbons	12	18-22	66-70
Good Bourbons	15	35	50

Rye whiskey when manufactured as a first-class article is made from 10 to 15 per cent kilned malt, 70 per cent rye, and the remainder rye-malt. Some distilleries replace a part of the rye by oats or barley.

Half rye whiskey similarly made as the above, except that for one half of the rye, corn is substituted.

Malt whiskey, in which malt predominates.

Wheat whiskey and

Oat whiskey are made in the same way as rye and half rye whiskey, except that wheat or oats is used in place of rye.

We must remark here, that the above appellations are only correct for the distiller, and that in commerce similar names are given to so-called compound whiskeys. Under this term are meant those products which are obtained from pure whiskey, either by dilution with water and rectified spirits, or by a mixture of several kinds, or by still further blending and mixing. In some cases, other liquors, as, for example, cognac, or rum, or even essences, are added to the pure whiskeys. This compounding is done in accordance with the requirements of local trade, or the special tastes and desires of the customers. The character of the natural product is dependent upon the materials and the methods of mashing and distilling. It is interesting to note that the taste of the public varies as the years pass by. In the United States during the fiscal year 1892–3, 40,835,783 gallons of Bourbon whiskey and 16,702,336 gallons of rye whiskey were made, while in the fiscal year just closed, the production of Bourbon whiskey was only 20,336,250 gallons, while that of rye whiskey was 21,587,221 gallons.

According to the mashing method we distinguish a "sweet mash" and a "sour mash" whiskey. The latter is characterized by a delicate, slightly sour taste and a fine ethereal aroma.

Mashing for Whiskey.— The material is ground separately, weighed in hoppers, and placed under a revenue-lock. In the smaller distilleries the corn is cooked with hot water, and kept boiling by means of steam until the starch is gelatinized. In larger distilleries the corn is gelatinized in high pressure cookers, under a pressure of 60 to 80 pounds. In either case the cooked corn is cooled down to about 164 to 166° F. In the high pressure cookers this reduction in the temperature is accomplished by a vacuum pump. In the smaller plants, malt, rye, or other cereals are added to the corn mash cooled to 164 to 166° F., so that the entire mash has a temperature of about 156 to 160° F. In the larger distilleries the specially prepared rye or malt mash is drawn into the

cooker by means of a vacuum pump. Here it is thoroughly mixed so that the final temperature is about 154 to 156° F. In order to obtain complete saccharification, mashing is done at this temperature for about 20 minutes, then the mash together with the grains are run into a collecting tub, from which it is pumped through a cooling system into the fermenters. The cooling system usually consists of a worm of a half inch copper pipe, which is encased in an iron water pipe. The mash flows through the copper pipe in one direction, while the current of water flows around the pipe in the opposite direction. It is always desirable to cool the mash to 64° F., but on account of the higher temperature of the cooling water, it is usually possible to cool the mash only to 66 to 68° F. At any rate its temperature should never be above 70° F. The concentration of the mash varies proportionately with the amount of material, and is usually about 18 to 25 per cent (seldom more), according to Balling.

While the mash is pumped into the fermenters, as much water or slop of the same temperature as the mash is added to the latter until its concentration is about 11 to 13 per cent, according to Balling.

The above-described method is used for sweet mash whiskey, while for sour mash slop is always used for mashing in place of water. The slop has not only acquired a definite acidity through the fermentation process, and certain peculiar and flavoring substances from the yeast, but also has obtained certain conversion products, formed by heating the grains in the distiller. Hence by the use of this slop, the whiskey receives those characteristics which have made it popular. In smaller distilleries, oak vats, so-called bushel tubs are used, into which boiling slop is poured, and corn in grits-form is doughed in under constant agitation with the hand (hence the name, hand-made sour mash). The malt and rye are added at 165° F. In medium-sized plants a large quantity of corn is doughed in in a similar manner in special mash tuns, and after the mash becomes somewhat thinner, due to the saccharification, it is pumped into hopper-like copper vessels. After the mashing off, the mash remains in the bushel tubs of the smaller distillery or in the vats of the larger plants for 20 to 24 hours for acidification. After this time, the mash is still of a somewhat solid consistency, so that it is separated in drums by means of a disintegrator. After cooling to the pitching temperature (64 to 68° F.), the mash is diluted with slop, to about 17 to 19 per cent, according to Balling. In some distilleries the concentration is lower.

The mashing process is different in very large distilleries, which have commodious mechanical appliances, and are prepared to mash vast amounts of material. It is customary to bring the corn mashed with water, to the boiling point by means of steam, and then to heat the corn to 300 to 310° F. (60 to 80 pounds pressure). The corn is kept at this temperature for 10 minutes in order to gelatinize the starch. The surplus steam is blown off, and the corn mash is cooled to about 164° F. At the same time, malt, rye, oats, or barley is mashed in with water in a special mash tank, which is supplied with a simple agitator and a double copper attemperator coil. After both mashes are united, the temperature is about 140 to 142° F., which is the temperature at which the largest possible amount of sugar is formed.

This mashing method is used in the large factories both for the manufacture of whiskeys, high wines, and spirits. The various brands of whiskey are then made by the use of different materials in varying properties. These large distilleries also use slop in place of water when making a sour mash whiskey. In order to obtain a higher degree of acidification, more lactic acid is allowed to form in the malt mash. In comparing the large distilleries with the smaller ones, we find that while the latter can pay more attention to the characteristic properties of the whiskeys, especially sour mash and fancy goods, the former does its practical work more technically and also obtains much higher yields. The manufacture of concentrated alcoholic spirits is only profitable when all the modern mechanical appliances are at hand, so that, owing to the constant decrease in the price of alcoholic spirits, the number of smaller plants is becoming less.

Fermentation of the Mash.— The sugary mash is fermented in the fermenters by means of yeast. In England, common ale yeast is usually added; in France and Belgium either top-fermenting or compressed yeast, which is also used by bakers, is generally added. In the scientifically operated German distilleries, the inventions and discoveries of modern times are successfully used, as for instance, a pure yeast culture of a distiller's yeast is made according to Hansen's method, just as a pure beer yeast is cultivated in many United States breweries according to the same method. (For a description of this process see under BREWING and YEAST and YEAST CULTURE.) In the United States distilleries a yeast obtained by spontaneous fermentation is generally used. Here Delbrueck's teachings in regard to natural pure culture are of importance. Experience teaches that when several yeast species are present, a certain one can be developed under certain conditions of nourishment, because a mash of definite concentration and proportion of fermentable to non-fermentable substances, made from definite materials, consequently containing definite percentages of albuminous and mineral substances, will vigorously develop at a definite temperature and acidity only one species of yeast and will suppress the rest. By maintaining the same conditions on a larger scale, that is, by using a greater amount of mash, the yeast thus developed can be further propagated. But in spite of the utmost care, natural pure culture is oftentimes defective, because the standard requirements are not rigorously observed. It may also happen that among the air yeasts which are developed for spontaneous fermentation, there is no species which will flourish under these requirements. Consequently, it would be advisable also to introduce in this country pure cultures, made from one individual cell, according to Hansen's method. Then the distiller would not be dependent on chance; and, of course, a pure yeast developed according to Hansen's method, would have to be cared for according to the principles of natural pure culture, as, otherwise, an infection with undesirable yeasts, mycoderma or fission fungi would gradually destroy the pure yeast.

In the United States distilleries the yeast is developed as follows:

A clear malt mash is made from ground

malt and pure water, generally condensed water. The water is boiled with hops, 1 oz. of hops per gallon of water, cooled to 170° F. and added to the ground malt, whereupon saccharification will take place. As soon as the conversion is completed, a clear mash is drawn either by filtration or extraction, which is then concentrated to 18 to 30 per cent according to Balling and cooled to 70° to 72° F. Air is forced into the mash in small copper vessels, so that after 24 to 48 hours the yeasts of the air will cause fermentation. This mash in the copper jugs is the so-called stock-yeast and is cultivated as needed. In case the yeast thus obtained is not satisfactory, the process is repeated. Most distillers constantly have a supply of this jug-yeast on hand and regenerate it by adding a portion of it to the above described, hopped, clear malt mash. This original yeast is poured into sterilized copper jugs and stored in an ice box or other suitably cool place.

This yeast is propagated for use in this way: Rye and malt are saccharified in water of 148 to 150° F. Acidification takes place during 24 hours, during which a temperature of 150° F. is maintained by means of a copper coil attemperator. After this period cold water is run through the attemperator, and the mash, having 18 to 20 per cent (Balling), is cooled to 66° F. and pitched with jug-yeast. After 12 hours this mash has sufficiently fermented, so that it can be used in pitching the large mashes.

The pitching temperature of the principal whiskey or spirit mash is usually 60 to 68° F. and in many cases of defective cooling is somewhat higher. The yeast mash is allowed to run to the main mash. The fermentation usually commences rapidly and shows an increase in temperature. After 24 hours the fermentation is most vigorous. The duration of fermentation is sometimes only 48 hours, for spirits and sweet mash whiskeys it is 72 hours, while for sour mash whiskey it requires 76 hours.

Sometimes abnormal conditions arise, among which is the so-called "foaming fermentation" that is an exceptionally stormy fermentation, in which losses of alcohol occur, due to the flowing over of the mash over the edge or rim of the fermenter. This is a result of various defects, and is either partly due to the materials, or the yeast, or may be occasioned by irregularities in the operation, or even by other causes. It would lead too far to enumerate them here, but much has been written on this subject by experts.

The fermented mash, called the sour mash, is now pumped into the distilling apparatus, where it is distilled as is fully described in the article DISTILLATION. It is customary to distil the whiskeys to 102–105 proof and spirits to 188–190 proof. In small distilleries an ordinary pot-still is used for whiskeys and a liquor of about 70 proof is obtained, which is concentrated to 101-102 proof in a doubler. A doubler consists of a copper cylinder having a wide outlet pipe, from which the vapors enter the condenser. In the small distilleries, the heating is accomplished by direct firing, by which a peculiar, characteristic taste, which is appreciated by the consumers, is engendered. Such whiskey is called "Fire Copper Bourbon Whiskey."

When oats, barley, or wheat are used in the manufacture of certain whiskeys, they are worked up in the same manner as rye in the above-described mash.

Potatoes are not mashed in the United States, although they are commonly used in Germany. They contain only 18 to 20 per cent of starch, while the cereals contain 60 and more per cent of starch. Instead of mashing the ground, rasped or chipped potatoes in open mash-tubs, as was formerly done and is even done to-day in small plants, they are now first steamed under a pressure of 2 to 3 atmospheres, whereby the starch is put in condition to be easily acted upon by the diastase. After the steaming the potato mass is cooled to 55 to 60° C. (131 to 140° F.), which is the best saccharification temperature. Then this mass is mixed with malt, generally green malt, either in the cooker or in the mash-tub, and saccharified. It is customary in Germany to make a thick mash of 22 per cent (Balling), sometimes even of 26 to 28 per cent. The fermentation is accomplished by the addition of a cultivated pure culture yeast. The distilling process is similar to our method. In Germany less brandy but more highly concentrated alcohol for industrial purposes is made.

A special liquor obtained from starchy substances is arrack, which is made in the East Indies, partly from rice and partly from the juice of the cocoa-trees, called toddy, from which "Arrack de Goa" is distilled. The rice is germinated and treated about the same as barley malt. Good arrack is said to be made from 30 to 35 per cent rice, 3 to 5 per cent toddy, 60 to 65 per cent molasses from the sugarcane.

In all those cases, in which a mealy substance is utilized, the thin slop remains after the distillation, which contains all the ingredients of the corn and yeast mash. Besides the skins and husks, we find albumen, unfermented sugar, lactic acid, acetic acid, glycerine, mineral substances, etc. This wet slop was mainly used as feed for cattle, so that formerly every distiller also had a herd of cattle. It is claimed that an animal's health will suffer if slops are copiously fed, so that on this account, and especially in order to dispense with some of the labor caused by the maintenance of the cattle, the slop was dried. By thorough drying, which can be done immediately after the distillation, spoiling is prevented and a constantly durable and valuable article of commerce, which need never be given away below its full value, is obtained. The drying of slop is accomplished in several operations: (1) Settling of the insoluble substances; (2) Pressing out; (3) Drying in cylindrical driers.

There are also some apparatus in which the slop is concentrated by means of steam, pressed and finally dried.

The feeding value of wet and dry slop can readily be seen from these analytical data, ob-

ANALYSIS OF THE SLOP.

Condition	Water	Proteids	Nitrogen-free carbohydrates	Fat	Cellulose	Ash
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Wet	91.2	2.34	3.63	1.22	0.88	0.74
Dry	11.94	23.43	36.35	12.22	8.78	7.28

tained by the Industrial Chemical Institute of Milwaukee in an analysis of slop in either condition. The mash material was composed of 80 per cent corn, 10 per cent rye, and 10 per cent malt.

Preparation of Alcohol from Koji, according to Takamine's patent.— This process, which is used in Japan in the manufacture of saké, was changed for other cereals by Takamine, a Japanese, and was introduced by him in 1893-4 in the Manhattan Distillery in Peoria, Ill. But this process has not been extensively used, so that now, after 10 years, it is almost forgotten, although it aroused considerable interest at one time. In this process the spores of a certain fungus, as for instance aspergillus oryzæ are exposed in hothouse-like compartments to uniformly moist air of 77° F. on steamed, coarse wheat bran. The spores rapidly develop to an exuberant white mold whose mycelium forms numerous spore-bearing threads which grow into the nutrient medium. A considerable portion of the nutrient medium is consumed and a decided rise in temperature is noticeable. According to the temperature, the formation of mold is finished in about 36 to 48 hours, whereupon the mass with the fungi is mixed with an equal amount of wheat bran and extracted in water, whereby the Koji-extract is obtained. This is added at 140° F. to corn, cooked in the customary manner, whereupon complete conversion is effected as with diastase. The mash thus obtained, which has a concentration of about 15 per cent according to Balling, is fermented in four days by means of a fungus, called takamoto, propagated in a similar manner to the Koji fungus. It is claimed that the yield in this process is 11 to 12 per cent higher than in the process now in vogue, so that it is really surprising that this process is not adopted.

In the Belgian distilleries Effront's system is successfully used to prevent disturbances in the operation of the plant caused by infection. The main principle in this system is that the highly antiseptic hydrofluoric acid or mono- or bifluoride of ammonia is added to the mash, through which the formation of lactic acid becomes unnecessary; the work is also much more accurate. Yet this process has not yet been introduced in the United States.

The Control of the Distillery.— It is self-evident that the control in the distillery is of prime importance in a rationally operated plant, for which reason also, the large distilleries which have well-equipped laboratories, work advantageously, while on the other hand, the small distillers constantly suffer large losses. The control is properly carried out when regular analyses are made of the raw materials of the supplementary articles, namely the yeast, the mash before and after fermentation, the slop, the water and also the air in the mashing and fermentation cellar. (The Kentucky distilleries use a pure, hard water, rich in lime.) It happens in too many cases that the control is not properly carried out, which is, of course, a loss to the distiller, although at present the small distiller is enabled to have the control carried out by a special laboratory (Industrial Chemical Institute of Milwaukee). When the control is properly exercised, the yield will be increased. Inasmuch as theoretically one pound of starch produces 0.5678 lb. of alcohol, then, according to Hantke, the highest possible yield of a distiller's bushel (which is always figured at 56 lbs. whether the material actually weighs that much or not) with

60 per cent starch in the material will be 5.76 gal. Proof alcohol.
61 per cent starch in the material will be 5.86 gal. Proof alcohol.
62 per cent starch in the material will be 5.95 gal. Proof alcohol.
63 per cent starch in the material will be 6.05 gal. Proof alcohol.

But actually the following yields are obtained from one bushel of grain (56 lbs.):

90 per cent corn + 10 per cent malt, about 4.7 gal. Proof, seldom 4.9 gal. Proof.
55 per cent corn + 35 per cent rye + 10 per cent malt, about 4.25 gal. Proof.
65 per cent rye + 15 per cent malt + 20 per cent of rye malt or oats, or barley — about 4.0 gal. Proof.

Among the sugary materials used in distilling, the molasses, both of the beet and cane sugar refinery, is used, and the production of liquor from molasses is continually increasing. Molasses contains about 70 to 80 per cent extract, of which about 50 per cent is sugar. On account of its concentration the molasses must be diluted and because of its alkalinity it must be neutralized. Hydrochloric acid is generally used for the neutralization. Molasses thus prepared is pitched with yeast and fermented just like a sweet mash, but in many cases it is difficult to ferment the molasses, probably because of the presence of butyric and other fatty acids, which are largely present and are known to retard and stop fermentation. Also very abnormal and undesirable fermentation phenomena, as, for instance, saltpetre fermentation, can be traced to the characteristic properties of the molasses. Lately a liquor is obtained from molasses in the United States which acquires a definite aroma and taste, according to character of yeast mash, so that it resembles certain standard brands, such as Bourbon, etc.

In the West Indies, especially in Jamaica, the molasses of the sugarcane, which is merely extracted to obtain the sugar, so that the molasses contains no admixtures as it does in our sugar refineries, is fermented and distilled. This product is called rum, in which the peculiar aroma is due to butyric ether. An inferior grade of rum is made from the sugar scum. Many brands of rum acquire their bouquet through the addition of clover leaves, Botany-bark, etc. Artificial rum, made by mixing spirit with rum essence and adding a little coloring matter, can readily be distinguished from genuine rum.

Sweet fruits, the juice of which is rich in sugar, also serve as raw materials for the spirit industry. The so-called Kirschwasser is obtained from cherries. Besides the juice, the extract also contains components of the cherry stones, which are crushed and added to the liquid.

Sliwowitz is obtained from prunes, and in like manner a liquor is obtained from peaches (peach brandy). In the East Indies a liquor is distilled from the fermented juice of the date palm, while in the West Indies the same is done with the fermented juice of the plantain. Pineapples, oranges, apricots and other fruits can also be made to furnish a liquor.

An important industry in the United States as well as elsewhere is the production of brandy in its purest form called cognac. It is the direct

product of the wine distillation. Its quality depends entirely upon the quality of the raw materials. The distillates of the wine distillation are characterized by being free from fusel oil. The aroma is due to œnanthic ether, which is also prepared artificially and is used in imitation cognacs. Cognac receives its brown color from being stored in oak casks.

The by-products of the wine distillation are also utilized, but, of course, furnish an inferior article. A fairly pure brandy can be made from the grape cakes, while the wine yeast furnishes a spirit of a very medium quality.

Gin, kummel, peppermint, etc., are common grain spirit distilled and flavored with juniper berries, caraway, peppermint, etc., mostly when the low wines are doubled. Above the pot-still there is a bell-shaped vessel, containing the flavoring material, and the vapors leaving the still pass over this flavoring material before they enter the dephlegmator or doubler.

The innumerable class of various sweet liqueurs, cordials, and ratafias are mostly only mixtures of good, almost fusel-free spirit with syrup and an aromatic substance, which produces the flavor. Most of them are obtained by steeping fruit or aromatic herbs in pure spirit and submitting the liquid to distillation. They are then colored and sweetened with sugar. The best known are absinthe, anisette, curaçoa, benedectine, boonecamp, crême de menthe, anise, and others.

Recipes for their preparation will be found in special works.

ERNST HANTKE,
Industrial Chemical Institute of Milwaukee.

Distilled Water. See DISTILLATION.

Distilling Industry. There can be no question but that alcohol is one of the most important substances produced by the art of man, for, outside of the extraordinary consumption of alcoholic liquors, it is more extensively applied, and to a greater number of purposes than almost any other manufactured liquid. In spite of the great demand, however, there is but one source from which alcohol can be obtained. It is produced from the fermentation of sugar or other saccharine matter that has been obtained from plants which contain either free sugar, or a starch convertible into sugar, and can be procured in no other way. Commercially, when such alcohol is made from grain, it is called grain-alcohol; when it is made from reindeer and Iceland moss, it is called moss-alcohol; when made from potatoes, or beets, root-alcohol, and, if from grapes, wine-alcohol.

Although the first historic mention of alcoholic liquors dates from the 11th century the art of distillation was known for centuries prior to that time. The Chinese had practiced it for hundreds of years before it was introduced into Europe, and tradition attributes its discovery to the Arabian alchemists. This art of distillation consists in the process of converting liquid into vapor in a closed vessel by the application of heat and reconverting it into liquid by conveying the vapor into a cooler vessel; thus, while spirits are not actually produced by distillation as much as by the prior act of fermentation, the distilling process separates the spirits from the mixture in which they have previously existed. Brandy, one of the first distilled liquors, was originally known as the "water of life," and one of the early alchemists was so enthusiastic over the discovery of this liquid that he declared that "this admirable essence is an emanation from the Divinity; an element newly revealed to man, but hid from antiquity because the human race was then too young to need this beverage, destined to revive the energies of modern decrepitude."

While brandy and several other distilled liquors had previously been made, the first product of the distillery to reach the dignity of a commercial position was called "rectified whiskey." This was a crude high-wine which had been prepared for sale by being passed through a layer of charcoal, a process which tended to extract the fusel oil. Later, this product was made more saleable by the addition of flavoring extracts, and by being put into heavily charred barrels, with a little sugar coloring to eradicate some of the rankness and fieriness that distinguished most of such liquors. This method of manufacture was followed until the process of redistilling was invented, when an apparatus was provided by means of which the fusel oil could be more thoroughly extracted from the spirits than had ever before been possible, while, to make the liquor more palatable, a certain proportion of old-fashioned Bourbon from Kentucky, or rye from Maryland, or Pennsylvania, was added to give the bouquet, flavor, and appearance of genuine whiskey. In fact, the sale of the goods known as "redistilled whiskey" became so general that the proportion as compared to the quantity of genuine Kentucky and other whiskeys sold was not less than 15 to 1.

Although the name "Bourbon whiskey" now has a wide significance, it was originally used to distinguish the particular kind of liquor that was distilled from Indian corn, or rye, in Bourbon county, Kentucky. At that time the yield of Bourbon whiskey was about in proportion to three gallons to the bushel, and it was so heavy in body and flavor that it was considered as of great value in the work of compounding, in spite of the fact that it required many years of maturing to neutralize the fusel, and other essential oils which it contained by the action of the atmosphere. Popular as this whiskey was from the days of its inception, its fame spread so rapidly that it was not long before other distilleries sprang into existence, in Kentucky and elsewhere, and as all of these manufacturers produced an imitation of "Bourbon," the best method of defining that liquor to-day is to say that it is a whiskey distilled from corn or rye, after the method which was originated in Bourbon county.

Great as the demand for this whiskey was, and, despite the fact that the trade was compelled to admit that such goods could not attain to full maturity, the only condition in which they were ready for consumption, within less than the specified three years, the improvements in the process of manufacture were slow. It was at about this time that some important changes were made in the science of mashing, and as these not only increased the yield, but lessened the cost of production, the Bourbon whiskeys, which had formerly been used so extensively for compounding purposes, began to attain wider popularity as a beverage. It was also quickly discovered that this increase in yield had not injured the quality of the whiskey,

but that, on the other hand, such goods were of finer grade, the proportion of fusel oil, the eradication of which required so much time, becoming less as the quantity of whiskey increased.

The whiskey upon which the reputation of Kentucky so largely depends is that kind of liquor that is known as sour-mash, but, unfortunately for the commercial integrity of the distillers, it must be admitted that there are comparatively few establishments that are so careful as to the preservation of their reputations that they will distil nothing but genuine sour-mash goods. At the present time the consumption of whiskeys of all grades made in Kentucky is estimated as being in excess of 25,000,000 gallons per annum, while the principal States in which ordinary spirits are produced are Illinois, Ohio, and Indiana.

Owing to its greater availability and cheapness, grain is the material which is most generally used in the distillation of liquors. Fruits, which are very good for this purpose when they can be obtained, are not only of a perishable nature, but they are not available during the greater portion of the year; thus, while apples, peaches, and grapes are used in the manufacture of distilled liquors in California, New Jersey, and Ohio, the output is necessarily limited. In the case of fruit brandys, the State of California manufactures a great deal more than half the total product of the country.

Rum, which was once one of the most popular of liquors, is now very little used in this country, being mainly manufactured for export purposes. Made of molasses as the chief material, its distillation is confined almost exclusively to New England, where its production is constantly decreasing, owing partly to the fact that grain-alcohols are cheaper to manufacture, and partly to the steadily increasing popularity of whiskey as a beverage. During the past few years several attempts have been made to distill pure spirits from molasses, but none of these experiments have been entirely successful, owing to the difficulty of eliminating the odor, which is always suggestive of rum. In the making of pure spirits, no aging is required. Such products of the still are ready for manufacturing purposes, or for compounding, the day they are produced, for, no matter how long they are kept, they cannot be improved. It is such a product that is doctored up by the use of coloring and flavoring to the appearance of genuineness in which it is possible to dispose of it as "genuine" whiskey, and some are even made to produce a fairly passable imitation of the real sour-mash.

In reviewing the products of the American distilleries it is necessary to give a little more than passing attention to the use of distilled spirits in the arts, manufactures, and medicines of this country. Among these alcohol and cologne spirits are the most important, although such products as high-wines, whiskey, brandy, gin, and rum, are also used for these purposes. Pure alcohol is a substance that cannot be obtained by the process of distillation alone. The alcohol, or rectified spirits of the pharmacopœias contain, in the United States, 9 per cent by weight of water, and, in Great Britain, 16 per cent; while the proof-spirits, or diluted alcohol, has 54½ per cent by weight of water in the United States, and 51 per cent in Great Britain. In spite of its general undesirability, there can be no doubt but that great quantities of alcohol are used as a beverage, and while it is impossible to collect anything like reliable data upon this subject, it has been estimated that no less than 15 barrels of alcohol are thus consumed in New York city alone every day of the year, and that fully one half of the alcohol which finds its way to the Northwest is used as a beverage by the Poles, Norwegians, Swedes, Hungarians, Finns, and Russians, who abound in that part of the country. It is also a well-established fact that the foreigners who are employed in the coal mines of Pennsylvania are great consumers of alcohol.

In the making of pharmaceutical preparations a large proportion of the cost is due to the use of distilled spirits in their composition. In many cases in which alcohol would be unsuitable, cologne spirits are used, while such liquors as whiskey, brandy, rum, and gin, furnish the basis upon which many proprietary medicines, tinctures, and medicinal wines depend, not only for their preservative qualities, but for their effect upon the human system. In fact, it has been estimated that no less than 15 per cent of all the distilled spirits consumed in the United States, are used in the arts, the manufactures, and in the making of medicines.

The entire production of distilled spirits in the United States for the year 1904 was 139,505,214 gallons, of which 20,274,089 gallons were bourbon whiskey, 18,371,343 gallons rye whiskey, 2,110,216 gallons gin, 1,801,179 gallons rum, 5,193,262 gallons fruit brandy, including apple, peach, and grape, 11,846,082 gallons alcohol, and the balance, 57,997,506 gallons, pure neutral spirits. The total consumption in the United States of domestic distilled spirits during the year 1904 amounted to 118,446,281 gallons, while the consumption of imported distilled liquors in that year was 2,655,716 gallons. The exports of distilled spirits for the year 1904–05 amounted to 3,514,529 gallons, the value of which was in excess of $2,500,000. The average quantity of grain used by the distillers of spirits during the past 10 years has exceeded 22,000,000 bushels, more than half of which has been corn, while the use of this grain has been the means of suggesting a collateral industry which has now become a factor of considerable importance, that of fattening cattle and hogs on the slops from the distillery.

In addition to the enormous production of liquors of which we have record, however, there is no doubt but that there are a large number of illicit stills throughout the country that are annually producing a great amount of distilled spirits that succeed in evading the government's tax. These illicit distilleries, which owe their existence to the inherent repugnance of a certain class of grain growers to pay the heavy tax which the government imposes upon the maker of distilled liquors, abound throughout the mountainous regions of the country, more especially, perhaps, in the Southern States. In such sections these small distillers make and sell their product, irrespective of any claim that the government may have in the matter, and as a large proportion of the liquors that are made are consumed in the same neighborhood, it is next to impossible to obtain any record of them.

Although it is true that the government has succeeded in making the distilling industry one of the most trustworthy sources of national in-

cure by the imposition of heavy taxes upon its production, those who are financially interested in the manufacture of liquors are advocating several reforms in legislation, all of which, they believe, will tend to aid the producer in furnishing a wholesome, and thoroughly matured beverage at a minimum cost. They hold that the present legislation fails in its primary object — the promotion of the public health and welfare — by enforcing a tax that is so high that its collection naturally tends to bring none but inferior grades of goods within reach of the masses, for the simple and very natural reason that the manufacturer, in order to meet the demands of so great an impost, will sometimes be almost compelled to consent to lower the standard of his goods, that he may save in quality the amount which he must pay in meeting the expenses of the tax. It is held that this factor is one of the direct reasons for the production of cheap imitation liquors, which are not only made out of common spirits to be sold practically the same day that they are made, whereas the honest maker of genuine whiskeys must hold his goods for several years while they are attaining that maturity that will enable him to place them on the market.

The history of the various combinations in which the American distillers have participated during the past 15 years is too long and too complicated a story to be told in so brief a space. Combinations have been formed and have failed, only to be superseded by others, none of which were without some influence in the progress and development of this great American industry. See BREWING AND MALTING; BREWING INDUSTRY; DISTILLATION, ETC.

Distinguished Service Order, an order instituted by Queen Victoria 6 Sept. 1886 for the purpose of rewarding the naval and military officers mentioned in despatches for their distinguished service. Foreign officers who have been associated with British forces in naval and military operations are eligible as honorary members, and the order ranks next to the order of the Indian empire. The original badge was a gold cross, enameled white, edged gold, with the imperial crown on one side and the cipher V.R.I. on the other, each enclosed in a laurel wreath.

Disto'ma, a trematode, or fluke worm, which is a form of parasite frequently present in cattle and occasionally, in the form of the *Distoma hepaticum*, affecting man. At least eight or nine different species of distoma are known. The commonest ones, however, are the liver flukes of sheep and cattle. The *D. hepaticum*, or the large liver fluke, and the *D. lanceolatum* are the commonest forms. In sheep, the worm gives rise to the disease known as "rot," which is frequently fatal. In man, the affection known as distomiasis results when the gall-bladder and liver passages become infected. The liver is usually enlarged, there is very frequently hepatic pain, jaundice, diarrhœa, vomiting, and ascites. Infection takes place largely through eating plants in which the egg or embryo are found. The domestic cat has a distoma, and in India, Japan, China, and Egypt other forms of fluke are known. A *D. hæmotobium*, or *Bilharzia*, is a special form that generally attacks the organs of the genito-urinary system and although rare, it is becoming sufficiently common in this country, as a result of intercourse with the inhabitants of our Oriental possessions, to cause a certain amount of apprehension that its distribution may become more general.

Disto'mea. See TREMATODA.

Distress, or Distrain (from the Latin *distringo*, to bind fast), is the taking of a personal chattel of a wrong-doer or a tenant, in order to obtain satisfaction for the wrong done, or for rent, taxes, or service due. The thing taken is also called a distress.

Distribution, in political economy, the apportioning of the products of industry among the people concerned. The methods of distribution have varied and do vary in accordance with the state of social development. They depend on legal as well as on economic conditions. They depend mainly on the ideas and institutions which prevail with reference to property in the three requisites of production — namely, land, labor, and capital. In countries where slavery prevailed, the slaveholder, as the owner alike of land, labor, and capital, disposed at his pleasure of the entire product of industry. Under the feudal system, the cultivator who was attached to the soil and had a fixed interest in it, was to render to his superiors dues in labor, in kind, and latterly in money, which were fixed by custom or authority. Where the system prevails of cultivators owning the soil, as in America, and among the peasant proprietors of the European continent, the owner, inasmuch as he unites in his own person land, labor, and capital, disposes of the entire product, except such portion as may be claimed by the money-lender. In cases where the state owns the land, the cultivator pays a rent or tax to the government, and retains the remainder. The *metayer* system still exists in Italy, the owner advancing the land and stock (in whole or in part), and receiving from the cultivator a fixed share of the produce, generally one half.

In Great Britain, and to a large extent in other countries with a highly developed industry, land, labor, and capital are supplied respectively by three different classes of persons, and their share in the produce is determined by free competition. The classical political economy of England may be defined as a description and analysis of such an economic condition of society. It claims to be a science only in so far as the competitive system prevails. The landlord's share in the produce thus determined is called rent; that of the capitalist and employer is designated as interest, profit, earnings of management, etc.; the laborer's share is wages. It should be pointed out that under such a system, the central function in distribution, as well as in production, rests with the employer. As he originates and controls the productive process, so in the distributive process he settles with landlord and laborer, and then disposes of the produce. If the employer operates in whole or in part with borrowed capital, interest on that capital must also be deducted from his share of the produce. All these claims satisfied, the amount of his share will depend on his success in disposing of the product.

Whatever the arrangements regarding property and the distribution of the fruits of industry may be, account must be taken of the share claimed by the government in the form of taxes, for the maintenance of the army and navy and

other means of defense, for justice and police, and for education, etc.

It is now admitted that economists have bestowed excessive attention on production, to the neglect of the problem of distribution. But the reproach has a much wider application than to economists merely, for it may generally be said that while modern communities have enormously increased their productive forces, they have not yet solved the problem of distribution. The enormous inequalities of distribution are a danger felt by all thinking men. It is a question which is more and more challenging the attention of statesmen and economists. An economic system can be satisfactory only when a high standard of production finds its complement in a reasonable and equitable distribution, supplying to the mass of the citizens the means for their due physical, intellectual, and moral development. For a special method of seeking to secure the equitable distribution of profits among those who earn them, see CO-OPERATION.

Distribution of Animals. See ZOÖGEOGRAPHY.

Distribution of Animals in North America. Knowledge upon this subject is deemed of such importance to the public that for several years the Department of Agriculture at Washington has been making scientific investigations, and publishing full reports of its observations and experiments.

When the boundaries of the life zones and areas are accurately mapped, the agriculturist, knowing the faunal area, and the beneficial or harmful animals, birds, and insects, can prepare in advance for the protection of crops. If no means have yet been found of exterminating an animal injurious to a certain crop, the first thing will be to ascertain the exact localities in when such animals exist, and those in which they do not. Mr. L. O. Howard, writing of the San José orange scale-insect, says: "It may prove to be a significant fact that, although nursery stock affected by this scale has for six or seven years back been sent to all the fruit-growing regions of the eastern States, according to our present information the scale has established itself only in regions contained within the so-called Austral life zone. Mapping the points of establishment, it is very interesting to see how accurately this distribution has been followed. This fact will relieve New England fruit-growers north of southern Connecticut; those inhabiting the greater portion of Pennsylvania, except in the southeastern one fifth and a western strip; those in New York, except for the strip up the Hudson River, and the loop which comes in from the northwest and includes the counties bordering Lake Ontario on the south, as well as those inhabiting the northern portion of the lower peninsula of Michigan and all of northern Wisconsin, from any fear of this insect. Such a condition of affairs would seem almost too good to be true, but the possibility of its truth is suggested by what we know up to the present time."

Agriculturists living within the area likely to be invaded by certain animals, large or small, can escape by planting crops not affected, while those living outside may largely increase their revenues by giving special attention to the cultivation of the crops that are affected in the adjacent life zone. A knowledge of the natural life areas and of their distinctive species and crops will enable farmers and fruit-growers to select the products best adapted to their localities, will help them in their battle with harmful species, and will thus put an end to the present indiscriminate experimentation by which hundreds of thousands, if not millions, of dollars are needlessly expended each year.

Previous to the beginning of the scientific work by the Department of Agriculture, the faunal areas east of the Mississippi valley had been recognized and in a general way defined, and attempts had been made to divide the country as a whole into areas of higher grade. Most zoological writers had agreed in apportioning the United States into three primary provinces or regions — an eastern, reaching from the Atlantic to the plains; a central, from the eastern edge of the plains to the Sierra Nevada and Cascade Range; and a western, or Pacific, from the latter to the Pacific Ocean. It soon became apparent, however, that in order to gain a clear conception of the facts and phenomena of distribution a careful study of the subject must be made in the field, where the actual range of mammals, birds, reptiles, and insects could be ascertained and the distinctive areas contrasted. With this object in view, and with the sanction and approval of the Hon. J. M. Rusk, secretary of agriculture, and the Hon. Edwin Willits, assistant secretary, an experimental biological survey was made in the summer of 1889. The area selected was the San Francisco Mountain region in Arizona, which, because of its isolation, altitude, southern position, and proximity to an arid desert, was believed to offer unusual facilities for a successful study of the problems involved. The area of which a careful survey was made comprises about 5,000 square miles, and enough additional territory was examined to make in all nearly 12,000 square miles. One result of this first survey was the complete overthrow of the main faunal areas previously recognized in the United States, and a radical change in the conception of the principles involved. In ascending the mountain a succession of climatic belts were traversed, similar to those encountered in journeying northward from the southern States to the polar sea, and each belt was found to be inhabited by a distinctive set of animals. The more important results of the survey may be briefly summarized as follows: (1) It was demonstrated that mammals, birds, reptiles, and insects are distributed by association of species; (2) that between the desert of the Little Colorado and the summit of San Francisco Mountain there are seven distinct zones or belts of animal life; and (3) on comparing the principal facts of distribution on this mountain with corresponding facts over the country at large, three important truths became apparent: (*a*) That the several life zones of the mountain could be correlated with corresponding zones long recognized in the eastern United States; (*b*) that these same zones are really of transcontinental extent, though never before recognized in the West; and (*c*) that the fauna of North America as a whole is properly divisible into but two primary life regions, a northern, or Boreal, and a southern, or Austral, both stretching across the continent from ocean to ocean.

The results of this experimental biological survey were so important and far-reaching as completely to revolutionize current notions of distribution. It was perceived that the Austral

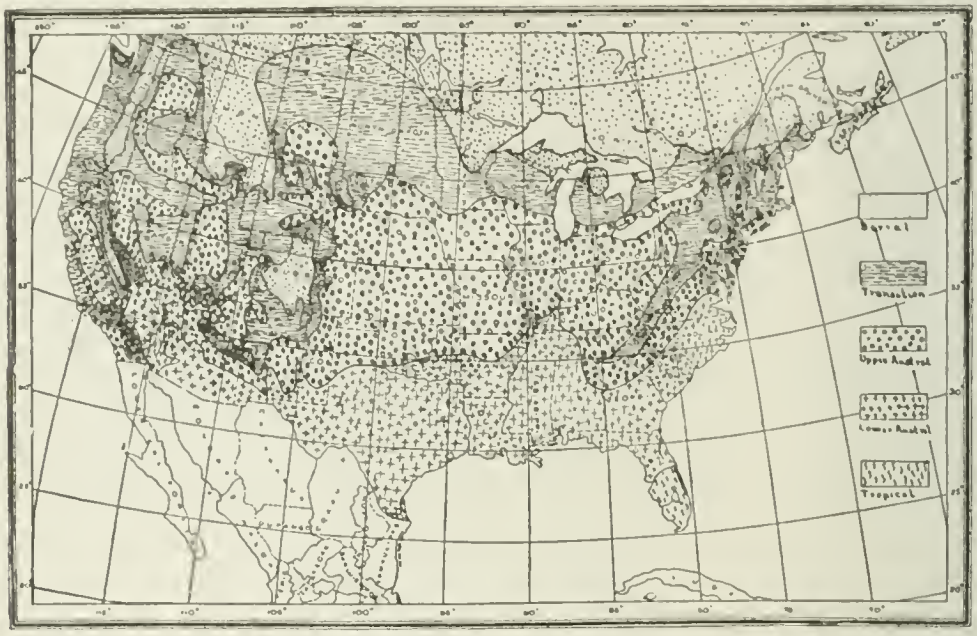
as well as the Boreal elements in the fauna are distributed in transcontinental belts; hence the arbitrary and irrational division of the United States into Eastern, Central, and Western "provinces" gave way before a rational system, based on a knowledge of the actual facts of distribution, which were found to conform to the general principle of temperature control early recognized by Humboldt and others.

In 1890 a biological reconnaissance was made of south-central Idaho, the area covered comprising about 20,000 square miles. The zones recognized were the same as in the San Francisco Mountain survey, except that the lowermost was absent. In the report on this expedition the courses of the several zones were described and the characteristic species of animals enumerated. In 1891 the most comprehensive and thorough biological survey ever undertaken was made by the division. An area embracing 100,000 square miles, stretching from the Pacific coast to the 113th meridian and from lat. 34° to lat. 38°, was chosen as the field of operations. This area comprises the greater part of southern California and Nevada, southwestern Utah, and the northwestern corner of Arizona, thus including all of the torrid desert valleys and ranges between the Sierra Nevada and the Colorado Plateau. It embraces also the highest and lowest lands within the United States — from Death Valley, nearly 500 feet below the level of the sea, to the lofty snow-capped peaks of the high Sierra, culminating in Mount Whitney at an altitude of nearly 15,000 feet. The region was selected because of the exceptional advantages it offered for studying the distribution of animals in relation to the effects of temperature and humidity at different altitudes. The close proximity of desert valleys and lofty mountains brings near together species which in a more level country are characteristic of widely remote regions. Thus, in one place on the east side of the Sierra all of the life zones of North America, from the tableland of Mexico to the polar sea, may be crossed in a distance of only 10 miles.

This expedition, which came to be known as the Death Valley expedition, determined the distinctive species of each zone, traced the courses of the several zones from California to the Colorado Plateau, and made large collections of the mammals, birds, reptiles, and insects, which collections are now deposited in the United States National Museum. The zones were segregated into the two great transcontinental regions — Boreal and Austral (see map).

In 1892 the northern boundary of the lower Austral zone was traced from New Mexico eastward across Texas, Indian Territory, and Arkansas to the Mississippi River. In 1893 a study was made, in the interest of biology, of Wyoming, a large part of which State was found to be from 1,000 to 3,000 feet lower than represented on current maps, and consequently the climate is warmer than was supposed by those not residents of the State. The Wind River and Big Horn basins and the plains east of the Big Horn Mountains were found to be upper Austral. Work was done also on the Great Plains in Kansas, Nebraska, the Dakotas, Utah, and on the tableland of Mexico. During the year 1894 a study was made of the greater part of Montana, and the work was continued in South Dakota and in the plateau region of Arizona. In Arizona two sections were run from the plateau south to the lower Austral.

In the annual report of the Department of Agriculture for this division for 1893, the seven life zones of North America, including the tropical, were characterized with special reference to eastern North America. Beginning at the north, these zones may be described as follows:



Map showing life zones of the United States.

1. The Arctic or Arctic-Alpine zone lies above the limit of tree-growth, and is characterized by such animals as the snow-bunting, snowy owl, white ptarmigan, polar bear, arctic fox, and barren-ground caribou or reindeer.

2. The Hudsonian zone comprises the northern or higher parts of the great transcontinental coniferous forest, and is inhabited by the wolverene, woodland caribou, moose, great northern shrike, pine bullfinch, white-wing crossbill, white-crowned sparrow, and fox sparrow.

3. The Canadian zone comprises the southern or lower part of the great transcontinental coniferous forest. Among the characteristic mammals and birds are the porcupine, varying hare, red squirrel, white-throated sparrow, and yellow-rumped warbler.

4. The Transition zone is the belt in which Boreal and Austral elements overlap. It covers the greater part of New England, New York, Pennsylvania, Wisconsin, and southern Michigan, and pushes south along the Alleghanies to the extreme northern part of Georgia. Here are the southern mole and cottontail rabbit, the oriole, bluebird, catbird, thrasher, chewink, and wood-thrush, the hermit and Wilson's thrushes, solitary vireo, boblolink, red squirrel, jumping mouse, chipmunk, and starnosed mole.

5. The Carolinian zone covers the larger part of the Middle States except the mountains; on the Atlantic coast it reaches from near the mouth of Chesapeake Bay to southern Connecticut, and pushes still farther north in the valleys of the Hudson and Connecticut rivers. It is the region in which is found the gray fox, fox squirrel, cardinal bird, Carolina wren, tufted tit, gnat-catcher, and yellow-breasted chat.

6. The Austroriparian zone covers the greater part of the South Atlantic and Gulf States, beginning at the mouth of Chesapeake Bay. Here the mocking-bird, painted bunting, red-cockaded woodpecker, and chuck-will's-widow are characteristic birds, and the cotton-rats, rice-field rats, wood-rats, little spotted skunks, and free-tailed bats are common mammals.

7. The Tropical region within the United States is restricted to southern Florida, extreme southeast Texas (along the lower Rio Grande and Gulf coast), and the valley of the lower Colorado River in Arizona and California. Among the birds may be mentioned the white-crowned pigeon, zenaida dove, quail doves, a Bahaman vireo, a Bahaman honey-creeper, and caracara eagle.

Since the time of Humboldt, at least, the fact has been recognized that animals are not universally distributed over the earth, but disappear along more or less definite lines which prominently indicate changes in temperature uncongenial to certain species; but exactly what temperatures exert the controlling influence, and how they can be measured, have only recently been discovered. Until recently the mistake was made of assembling all the temperature data in accordance with a single hypothetical law. Then a radically different plan was tried: the temperature data were platted in accordance with two widely different principles — one with reference to the northern, the other to the southern, boundaries of the zones. This departure was suggested by a somewhat tardy recognition of the fundamental facts of the distribution discovered in 1889; namely, that animals are themselves distributed from two directions — Boreal species from the north, and Austral species from the south. It seemed reasonable to infer, therefore, that northward distribution should be governed by one set of temperatures, and southward distribution by another. When the sums of the positive temperatures for a large number of localities in the United States were platted on a large-scale map it was found that isotherms could be drawn that correspond almost exactly with the northern boundaries of the several zones. In the case of the southern boundaries a greater difficulty was encountered, for no data had been published bearing on the temperature control of southward distribution. At the same time it seemed evident, from data previously collected by the division, that species are limited in their southward distribution by the mean temperature of a brief period during the hottest part of the summer. For experimental purposes the mean normal temperature of the hottest six consecutive weeks of summer was assumed to be the factor desired, and this temperature was platted for a large number of localities. Isotherms were then drawn which marked the southern boundaries of the several zones along the Atlantic coast, and it was found that in ranging westward these isotherms conformed throughout to the tortuous boundaries of the Boreal, Transition, and Upper Austral zones, previously mapped from a study of the actual distribution of animals.

The most zealous upholder of the laws of distribution of animals does not claim that the subject has been disposed of in all its details; but it is believed that the general principles controlling the geographical distribution of animals have been discovered, and that they may be expressed as follows:

1. In northward distribution animals are restricted by the sum of the positive temperatures for the entire season of growth and reproduction. 2. In southward distribution they are restricted by the mean temperature of a brief period during the hottest part of the year. It is believed that these two principles cover the fundamental facts of distribution. The modifications of land and water are always to be considered. Consult: Reports of United States Department of Agriculture; especially, 'North American Fauna' (No. 3, 1890); 'Insect Life' (VII. No. 4, 1895); 'North American Fauna' (No. 5, 1891); 'North American Fauna' (No. 7, 1893); also Allen, 'Geological Distribution of the Mammalia' (Bulletin U. S. Geological Survey No. 4, Vol. IV.); Baird, 'Distribution and Migration of North American Birds' (Series 2, Vol. XII. of 'American Journal of Science and Arts'); and Coues, 'Fur-bearing Animals,' etc.

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Distribution of Plants. See Plant Geography.

District, in the United States. The term has been used historically and currently in five legal senses, besides the vague one of "section of country." (1) Organized bodies of territory administered by the Federal government, not populous or compact enough for Territorial institutions, or for other reasons withdrawn from that system. The District of Columbia, first district, then Territory, then district again; Alaska before its Territorial organization; and from 1804 to 1812 that portion of the Louisiana

Purchase north of the present boundaries of the State of Louisiana, are instances. (2) The counties in South Carolina were called districts till late in their history. (3) A State or portion of a State in its function as the seat of jurisdiction of a United States court. (See DISTRICT COURT.) Judicial districts never cross State lines. (4) Politically, a section of a State or municipality fixed by law for purposes of legislative or congressional representation. Where the former is based on counties, it is always a defined part of a county, never crossing the lines; if on towns, usually the State senate is chosen from districts made up of certain towns or parts of cities, equally, never confounding two. The Congressional districts are marked off by the State legislature after the new apportionment of a census; sometimes in such a way as to give the party then in control of the legislature a greater number of congressmen than its share of the popular vote entitles it to. (See GERRYMANDER.) (5) A taxing district, by decision of the Supreme Court, is any section of a State described in a statute or order as to be assessed, without respect to political divisions. A remarkable instance was the abandonment of its city charter by Memphis, Tenn., when plundered into ruin by a political ring, and constituting itself the Taxing District of Shelby County, to escape suits against the city as a corporation.

District of Columbia, the national capital and its adjoining territory, owned and administered directly by the United States government, to prevent its actions being hampered by conflicts with local jurisdictions. It consists of 60 square miles of land and 10 of water on the eastern side of the Potomac, at the head of deep-water navigation; an enclave in Maryland, with three rectangular sides and the fourth following the lines of the river, besides the islands in the tidal river. Near the southern side of the district, forming the eastern and southern boundary of the city of Washington, is the large tidal estuary of Anacostia River or the eastern branch of the Potomac; the northwest boundary is formed by Rock Creek, separating Washington proper from Georgetown. There are several brooks. The district is flat and marshy for some distance back, then rises into gentle hills and swells; there is pleasing scenery along Rock Creek. The geological formation is Cretaceous, overlaid with drift; in the latter has been found the conglomerate called breccia, from which handsome columns have been carved, used in the capitol. The soil is light, and especially suitable for market-gardening, to which with dairying and the pasturage for the cows it is chiefly devoted, outside the built-up sections. The nature of the capital as a "court city" gives flower-gardening a great importance, and over $500,000 worth are sold annually. The farms are very small — about 35 acres for white and 18 for colored occupants. But little over a fifth of the surface is in farms, however; the city and its suburban villages, the great National Park, and reserved grounds of various kinds, taking up most of it. The climate is excessively variable, but generally humid and warm. The rainfall averages 50 inches a year.

The District originated in the politics of the Confederation time. Until the adoption of the Constitution, the Continental Congress assembled on 10 occasions at 8 different places in succession, at Philadelphia, Baltimore, Philadelphia, Lancaster, Pa., York, Pa., Philadelphia, Princeton, N. J., Annapolis, Md., Trenton, N. J., New York. The first five were during the Revolution. On 21 June 1783 a band of unpaid militia broke up the session in Philadelphia by hooting the members and pointing muskets in at the windows. This emphasized the need of a district guarded by federal troops, and on 7 October Congress resolved to erect a building near the falls of the Delaware (Trenton). The jealousy of the South, however, demanded one also near the falls of the Potomac, and alternate meetings in the two. Finally a majority abolished the second proposition, and a committee was appointed to lay out a town as first voted. There was no money under the Confederation, however, to build or do anything else, and no action was taken on the committee's report. It had been voted to meet in New York till the Federal town was ready; but this was disliked from fear of the "money power" corrupting or overbearing Congress. Philadelphia was proposed, but objected to by the southerners because the Quakers favored abolition. The first Congress under the Constitution revived the government-district plan, but on the banks of the Susquehanna. Finally Jefferson gave a dinner and arranged a "log-roll": two anti-Federalists from the Potomac region, who had voted against the assumption of the State debts by the national government, changed their votes on condition of the Federalists voting to fix the new capital on the Potomac, after remaining 10 years at Philadelphia. The act was passed as agreed 28 June 1790, for establishing the seat of government "at some place between the mouths of the Eastern Branch and the Connogocheague." The first session of Congress was to be held in the new place the first Monday in November 1800. Maryland in 1788 ceded Washington County, and Virginia in 1789 Alexandria County, forming a district 10 miles square; Washington in person laid it out under the Act of 30 March 1791 (having previously sold all his lands in the vicinity). The territory selected included the site of Powhatan's village, Anacostan or Nacochtank; also the existent village of Georgetown, laid out in 1751 and incorporated in 1789,—both on the Maryland side; and on the Virginia side, Alexandria, formerly Belhaven. The site of the new capital itself had been the plantation of one Pope, classically inclined, who by a curious prevision called his hill the Capitol and a brook near by the Tiber. Until 9 September the site was called "The Federal City"; then, by order of three commissioners appointed by President Washington, the district was named "The Territory of Columbia," and the city "The City of Washington." For the latter, see that title; also CAPITOL, where is noted the project, after its burning by the British, of removing the capital north, which was carried by the speaker's casting vote, but buried in committee. In 1846 no Federal buildings having been erected on the Virginia side, nor likely to be, Alexandria County was retroceded to that State. In 1871 the business men of the District, fretting under their political nullity, it was constituted a Territory with a governor and legislature, and delegates in Congress; but was at once seized upon by a ring of speculators who obtained control of its government and plundered it into bankruptcy. In 1874 the territorial government was



1. Soldiers' Home.

2. Falls of the Potomac.

abolished and direct government by Congress restored, through three commissioners appointed by the President and confirmed by the senate.

The commission of 1874 was a temporary government; in co-operation with Congress and the citizens of the District, it framed as a permanent system the Act of June 1878, which the Supreme Court has pronounced "the constitution of the District of Columbia." Under this Act half the expenses of the District, previously laid entirely upon the residents, are paid by the national government, as the owner of more than half the real estate. There is no popular suffrage, the entire executive government being in the hands of commissioners appointed by Congress; they recommend legislation and appropriations to the latter, which in turn consults them in the same matters. The government, though not appointed by popular vote, is nevertheless swayed by public opinion; and so excellent that agitations for restoration of suffrage meet no support. The judiciary of the District dates from 1801.

Population. — 1800: Washington, 8,144; Alexandria, 5,949. 1810: Washington, 15,471; Alexandria, 8,552. 1820: Washington, 23,336; Alexandria, 9,703. 1830: Washington, 30,261; Alexandria, 9,573. 1840: Washington, 33,745; Alexandria, 9,967. 1850: Washington, 51,687; 1860 (same) 75,080; 1870 (same) 131,700; 1880 (District of Columbia), 177,624; 1890 (same), 230,392; 1900 (same), 278,718, of whom 218,196 were in Washington proper and 14,549 in Georgetown. Of these, 20,119 only were foreign born; but 87,186 were colored; (1905) 322,445.

District of Columbia, Courts of. See COURT.

District Courts. See COURT.

Ditch, a trench or fosse on the outside of a fortification or earthwork, serving as an obstacle to the assailant and furnishing earth (déblai) for the parapet (remblai). It is from 90 feet to 150 feet broad, in regular fortifications, and 10 to 12 feet deep below the natural level of the ground. The fosse around a Roman encampment was usually 9 feet broad and 7 feet deep; but if an attack was apprehended it was made 13 feet wide and 12 feet deep. The agger, or parapet, of the encampment was raised from the earth to the fosse, and was crowned with a row of sharp stakes.

Ditchfield, Peter Hampson, English author and clergyman: b. Westhaughton, Lancashire, 20 April 1854. He was educated at Oriel College, Oxford, entered the Anglican priesthood, and has been rector of Barkham, Berkshire, from 1886. He has published: 'An Ecclesiastical History of Reading' (1883); 'The Romance of Mathematics' (1886); 'Our English Villages' (1890); 'Old English Sports and Customs' (1891); 'The National Churches Series — Germany, Spain, Ireland, Netherlands, Italy, France, Scotland, America, England' (1891–7); 'Guide to Berkshire' (1892); 'Sigund,' a cantata (1893); 'Books Fatal to Their Authors' (1895); 'Old English Customs Extant at the Present Time' (1896); 'Bygone Berkshire' (1896); 'The Sorceress of Paris' (1896); 'The Story of Our English Towns' (1897); 'Memorials of Old Buckinghamshire' (1902).

Dithyram'bus, or **Dith'yramb,** in Greek literature, a form of lyric or poem sung in honor of the god Bacchus, at his festivals. Since these festivals were celebrated with all the extravagance which would please the god of wine, the dithyrambus employed in his worship naturally breathed the same frenzy. The character of the dithyrambus therefore requires bold images and lofty periods. The more apparent disorder it contains, the more it partakes of the fire of intoxication, the better it sustains the true dithyrambic character. In the wild Phrygian music it was sung in choirs. Arion of Methymne, in the island of Lesbos, was the first to give a regular choral form to it, about 625 B.C. Lasos of Hermione is said to have been the first who introduced dithyrambic contests into the public games. The expression *dithyrambic poem* denotes, also, any lyric poem filled with a wild and impetuous enthusiasm, as is the case with many odes of Pindar.

Dit'marsh, or **Ditmarshes** (Ger. *Dithmarschen,* "the German marshes"), a district of Holstein in Germany, along the German Ocean, between the mouths of the Elbe and the Eider, so little raised above the sea as to require the protection of strong embankments. Area, 500 square miles. Pop. over 80,000.

Dit'tany (*Dictamnus*), a genus of plants belonging to the rue family (*Rutaceæ*). The members of this genus are beautiful plants, with alternate compound imparipinnate leaves. Their flowers are large, and white or purplish in color. They are arranged in racemes, the peduncles and pedicels of which secrete in numerous more or less prominent glands the essential oil which gives these plants their odor. Their roots were formerly used in medicine; their flowers furnish the perfumer with a fragrant distilled water. The most common species is the *Dictamnus fraxinella,* the leaves of which greatly resemble those of the ash (whence its specific name, from the Latin *fraxinus,* an ash-tree). It is said that in hot weather the odoriferous particles thrown off from this plant form an inflammable atmosphere around it; and if a lighted candle be brought near the plant, especially in a time of drought, there is a burst of flame around the plant. The dittany of the United States (*Cunila origanoides*) belongs to the mint family (*Labiatæ*), and is the only one of the 15 species of the genus native in America. It is an exceedingly aromatic herb, with purple-pink flowers arrayed in loose clusters. It is found from New York to Florida, and west to western Georgia and Ohio. The dittany of Crete is *Origanum dictamnus,* and the bastard dittany is a species of *Marrubium* (hoarhound), both labiates.

Ditters von Dittersdorf, dĭt'tĕrs fŏn dĭt'tĕrs-dôrf, **Karl,** German musical composer: b. Vienna 2 Nov. 1739; d. 31 Oct. 1799. He is particularly distinguished in comic compositions, and perhaps unrivaled in this branch of music among the German composers. Several of his operas were represented with great applause even in Italy: 'Doktor und Apotheker'; 'Betrug durch Aberglauben'; and 'Die Liebe im Irrenhause,' were among the most successful of these. He also acquired considerable reputation by his oratorio 'Esther,' which secured his elevation to a place among the Austrian nobility.

Ditton, Humphrey, English mathematician: b. Salisbury 29 May 1675; d. 15 Oct. 1715. Through Sir Isaac Newton he received the ap-

professorship of mathematical master at Christ's Hospital, which appointment he retained till his death. In 1714, in conjunction with Whiston, he published a new method for finding the longitude at sea, as well as on land. He was the author of several mathematical works, the principal of which are the following: 'General Laws and Nature of Motion' (1705), 'Institution of Fluxions' (1706); 'Treatise on Perspective, Demonstrative and Practical' (1712); 'New Law of Fluids' (1714). He also wrote a 'Discourse Concerning the Resurrection of Jesus Christ' (1712), which was afterward translated into several languages.

Diu, dē'oo, an island of India, belonging to the Portuguese, off the south extremity of Guierat. On a point on the east end of the island is the fortified town of Diu. Pop. 12,630.

Diuretics, drugs used to increase the elimination of urine. Such diuretics may be direct, in that they affect the renal epithelium, or indirect, in that they increase the blood pressure within the kidney and thus increase the urine elimination. This is largely an artificial classification, since it would seem that urine is always a true secretion and not a filtrate, and the renal epithelium must always be involved in the process of manufacture. Still it is a subdivision that has received wide recognition. Diuretics are frequently used in a number of heart, lung, and kidney diseases; because in the normal elimination of urine certain catabolic products are cast off from the body in the urine. If they are retained, however, they give rise to various degrees of intoxication, which may be even fatal. Thus in certain heart diseases, either from insufficient pressure, or from accompanying disease of the blood vessels, the elimination of the ordinary amount of urinary solids may be insufficient and result in poisoning. Hence diuretics, by increasing the elimination of urine, increase the output of these poisonous products. In all patients for whom diuretics are useful, certain concomitant drugs are of benefit. Those namely that empty the bowels freely and those that increase the elimination of perspiration. Of the numerous diuretics the saline salts of potassium, sodium, lithium, calcium, magnesium, the heart tonics, such as digitalis, adonis, caffeine, strophanthus convallaria, theobromine, are most frequently employed. To this list calomel, copaiba, cubebs, juniper, oil of sandal, and other irritating diuretics might be added. Injections of hot water into the rectum cause a pronounced diuresis, and this method is now recognized to be one of the best modes of inducing an increased elimination of urine.

Divan. 1. With the Turks, the highest council of state: the Turkish ministry. Every pasha has also a divan. 2. In the large mansions of the rich in Turkey a divan signifies a large hall for the reception of visitors, which communicates with a number of ante-chambers surrounding it, and which contains sofas placed round the walls, often adorned with costly tapestry and richly embroidered cushions. 3. Divan, with the Arabs, Persians, and Turks, is used to denote a complete collection of lyric poems, which they call ghazals, and through each of which one single rhyme extends; they never exceed the length of 14 strophes. Such a collection is complete if there are as many divisions as there are letters in the alphabet of the respective languages, and each division contains at least one poem, the rhymes of which terminate with the letter under which the division falls; some letters are excluded, as few or no words end in them. Goethe applied this name to a collection of poems by himself, written in the eastern fashion. 4. The word is also applied to a soft cushioned seat for the accommodation of several persons.

Diver, a name properly restricted in ornithology to birds of the family *Colymbida* (q.v.), but applied with little discrimination to various other water birds of similar habits. The compact, depressed body, powerful, posteriorly placed legs with fully webbed feet, the long sinuous neck, and stout acute bill admirably adapt them for aquatic life and the pursuit of fish. They are strong flyers, but on the land are awkward and stand nearly upright. The plumage is peculiarly compact and resistant to water. Three species are well known in the United States. The great northern diver or loon, *Urinator* (*Colymbus*) *imber*, is a large bird, sometimes attaining a length of three feet. Above the plumage is a lustrous black with green and purple metallic reflections, and marked with numerous white spots and streaks; below, a nearly pure white. The loon is distributed throughout the entire northern hemisphere on both fresh and salt waters, and during the winter is found in all parts of the United States, in the northernmost of which it breeds, building its nest among the rushes near or in the water, and laying as a rule but two eggs. The loon is best known by the extreme facility with which it dives at the flash of a gun, thus escaping injury while the ball speeds harmlessly overhead, and for its wild resonant cry, about which many traditions and myths have arisen. It can remain several minutes under water, and swim 100 yards before rising to the surface for air.

The red-throated diver (*U. lumme* or *C. septentrionalis*) is eight or nine inches shorter than the loon, of a rusty black, with profuse small white spots above, white below, with a large distinct chestnut-colored patch on the lower part of the throat. It is distributed like the loon, but is rather more northern, and is found in the United States in the winter only. The black-throated diver (*U. arcticus*) is intermediate between the other two species, from which it is distinguished by a blue-black neck-patch. It is a high northern species, and is represented within the limits of the United States chiefly by a western variety which occurs abundantly on the Pacific coast in winter. Consult: Baird, Brown, and Ridgway, 'Water Birds' (1884); Elliot, 'The Wild Fowl of the United States' (1898).

Dives, dī'vēz (Lat. "rich"), the name popularly adopted for the "rich man" in the parable of the rich man and Lazarus, Luke xvi.

Divi-divi, dē'vē-dē'vē, **Libi-dibi,** or **Libi-divi,** the astringent bean-pods of *Cæsalpinia coriaria*, a tree which grows in northern South America, in the Antilles, and in Mexico, and a member of the family which yields sapan, brazil, and other red woods. The pods are about one inch broad and three inches long, but are generally bent or curled up, and tend to scale off on the outside. They have a pale brown color with a tinge of yellow; sometimes they are spotted and black, and then they are not so good. They are very rich in tannin (especially

in the pod), good samples containing as much as 40 to 50 per cent, and form one of the best tanning materials. They are largely used in calico-printing for blacks and dark shades.

Divide, The Great, or The Continental Divide, names given to an elevated ridge of land in the United States where occurs the parting of the waters which flow to the Atlantic and the Pacific oceans. The name, "The Great Divide," is now commonly applied to a broader extent of country than the Continental Divide or watershed proper. It comprises that region in Montana and Wyoming wherein so many of the large rivers of the United States have their source, and which possesses within itself nearly all the characteristics of a continent. The arrangement of the elevated land masses in relation to the valleys and plateaus is continental; the temperature and vegetation vary almost from that of the tropics to the frigid zones; its mineral wealth is enormous; and its wild animals and great varieties of fish make it the paradise of the hunter and the angler. Its waters flow to the Gulf, the Atlantic, and the Pacific oceans, and streams rise on its eastern border-land whose waters flow to the Arctic Ocean. It is the natural geographical centre of North America.

Dividend, in arithmetic, a number to be divided by another; thus, if 20 is to be divided by 4, 20 is the dividend, and 4 the divisor. In commerce the fractional part of the assets of a bankrupt which is paid to the creditor in proportion to the amount of the debt which he has proved against the estate of the debtor; or the sum periodically paid as interest on loans, debentures, etc., or distributed as profit on the capital of a railway or other company. The sum to be divided is broken up into as many portions as there are bondholders or shareholders to claim them, and the fractional part falling to each holder bears the same proportion to the whole dividend as the amount of stock or shares he holds bears to the whole capital.

Dividing Engine, a machine for marking the divisions on the scales of scientific, mathematical, or other instruments. Some of these machines perform work of extraordinary fineness and accuracy. In making astronomical instruments, spectrometres, metre rods, and such exact instruments, the dividing engine is almost indispensable. Joseph von Fraunhofer was the first to make the instrument for ruling gratings, but others soon followed his lead. See FRAUNHOFER, JOSEPH VON; MICHELSON; ROWLAND; RUTHERFURD; and article on SCREW.

Dividing Range, Great, an Australian chain of mountains, forming the watershed between the rivers flowing into the Pacific and those running westward. It stretches from Cape York on the north to Wilson's Promontory on the south.

Divina Commedia, dē-vē'nā kŏm-mā'dē-ā. See DANTE.

Divina'tion (Lat. *divinatio*), the art or act of foretelling future events, or discovering things secret or obscure, by the aid of superior beings, or by other than human means. The derivation of the word indicates a belief that omens are sent by divine interposition. Natural divination was anciently thought to come by divine afflatus; artificial divination, by signs, omens, etc. At an early time divination formed a regular science, intimately allied with religion and furnished with rules and regulations. Even though divination did not have its origin in fraud, it became a fruitful source of imposition. Moses prohibited divination expressly (Deut. xviii. 11). Saul expelled "those that had familiar spirits, and the wizards," from his kingdom; yet he was weak enough to consult the famous witch of Endor shortly before the battle in which he fell. The Egyptians and Greeks had their oracles. With the Romans divination and witchcraft were brought into a kind of system, and constituted part of their religion. (See AUGURS and ARUSPICES.) The ancient Germans had consecrated white horses, from whose snorting and neighing they drew favorable or unfavorable signs. They also followed the guidance of prophetesses, whom they called *Alrunes*. Many Christians, from the period of the 3d century, adopted the *sortes biblicæ* or *sortes sanctorum* — a mode of judging of the future by opening the Scriptures at random, and forming an opinion from the passage on which the eye happened to fall. (See BIBLIOMANCY.) In early times Virgil's Æneid was also used for the same purpose (*sortes Virgilianæ*). All the ancient Asiatic tribes had modes of divination; and sorcerers are common among the Indians of America. Many of the old forms of divination continue to be practised in Christian nations at the present day, sometimes from superstition, sometimes for amusement, gypsy fortune-tellers being often resorted to. There are many names for the different modes of prognosticating the future by means of the various appearances which nature and art present, from the revolutions of the stars down to the grounds of a coffee-cup. The following by no means exhaust the list, as the different modes of divination that have been practised are almost endless: Aëromancy, divination by air; aleuromancy, by flour; arithmomancy, by numbers; bibliomancy, by the Bible; capnomancy, by smoke; catoptromancy, by mirrors; cheiromancy, by the palm; cleidomancy, by keys; ciromancy, by wax; geomancy, by the earth; hepatoscopy, by the liver of animals; hydromancy, by water; lampadomancy, by lamps; necromancy, by corpses; nephelomancy, by clouds; oneiromancy, by dreams; pyromancy, by fire; rhabdomancy, by rods. The works on this subject are very numerous, including the mystical productions of the East, the Cabala (q.v.), the treatises on astrology, witchcraft, etc., in the Middle Ages, and the studies of more recent writers. See ASTROLOGY; BLACK ART; CUP, DIVINATION BY; CLAIRVOYANCE; ORACLE; PALMISTRY; WITCHCRAFT.

Bibliography.— Bouché Leclercq, 'Histoire de la divination dans l'antiquité'; Cicero, 'De Divinatione'; Ennemoser, 'History of Magic'; Jung-Stilling, 'Theorie der Geisterkunde'; Schneider, 'De Divinationum Origine et Progressu.'

Divine Right, the doctrine that the right of sovereigns to rule is derived immediately from the Deity, whose representatives they are, and that accordingly they are not responsible to their subjects for their method of governing, nor to any other human court of appeal. This was the doctrine to which the Stuarts were so much attached, and which was taught almost universally by the clergy of the Church of England and in the universities after the Restoration.

Even the tyranny of James II. was not enough to induce the English clergy to renounce this favorite doctrine, and after the revolution about 400 of them, including some of the bishops, sacrificed their benefices rather than forsake their principles in the matter. After this time the theory of divine right and passive obedience was little more heard of in England.

Diving, plunging into water and remaining submerged for greater or less periods of time, with or without communication with the atmospheric air. Diving without the aid of some artificial means to supply the diver with air under water is now rarely practised (unless for amusement) except in sponge, coral, and pearl fishing, and sometimes for recovering treasure from wrecked vessels. The best divers are able to remain about one minute and a third under water, and only in extreme and exceptional cases as long as two minutes. Instances are recorded of divers remaining four, five, and even six minutes under water, but these are of questionable authenticity.

To enable divers to remain for a considerable time (sometimes five or six hours) under water a diving dress has been used, which is so contrived that the diver is constantly supplied with air from above. It consists of a waterproof dress, to which is attached a neck-piece or breastplate fitted with a segmental screw bayonet joint to which the head-piece or helmet, the neck of which has a corresponding screw, can be attached or removed by one eighth of a turn. Air is supplied by means of a flexible tube, which enters the helmet and communicates with an air-pump. To allow of the escape of the used air there is another flexible tube which is led from the back part of the helmet to the surface of the water. There is a signal line attached to the diving dress, by which the diver communicates with the attendants, and he carries another line in his hand to guide him in returning to the rope or ladder by which he descends.

The diving apparatus now in use makes the diver independent of any connection with persons above the water. A strong metallic air reservoir of steel is carried on the diver's back. A respiratory tube issues from the chamber, and is terminated by a mouth-piece which is held between his lips and teeth. This tube is furnished with a valve which permits the expulsion of air, but opposes the entrance of water. When the diver wishes to leave the water he inflates his dress with air from his reservoir and immediately rises to the surface.

Diving-bell, a device by which work may be carried on under water with a full supply of atmospheric air. To illustrate the principle of this machine take a glass tumbler, plunge it into water with the mouth perpendicularly downward; it will be found that very little water will rise into the tumbler, but as air is compressible, it could not entirely exclude the water, which by its pressure condensed the air a little.

The first diving-bell we read of in Europe was tried at Cadiz by two Greeks in the presence of the Emperor Charles V. The first of any note was made by Dr. Halley. The diving-bell is most commonly made in the form of a truncated cone, the smaller end being closed and the larger one open. It is so suspended that it may sink full of air, with its open base downward. As a diving bell of the ordinary construction is open to the objection of not being easily moved about, an ingenious kind of diving-bell, called a *nautilus*, has been invented, which is not open to this objection, but which is entirely at the command of the occupants, who can make it sink or swim, and move it about at pleasure, and can use it at the same time to raise great weights and convey them to any desired spot. See DIVING; NAUTILUS.

Divining Rod, a forked rod or branch, generally but not necessarily of hazel, by means of which, according to a popular belief not yet wholly extinct, the presence of water, minerals, etc., underground, can be detected. When used, the rod, which is carried slowly along in suspension, will, as is affirmed, dip and point toward the ground when brought over the spot where the concealed water or mineral is to be found.

Divisibility, the capability of being separated into parts. A metaphysical problem, long discussed by philosophers on abstract principles, is the divisibility of matter. The microscope reveals only to an infinitely small extent the subdivision of substances and tissues, organic and inorganic. Even in the mechanical productions of art distinctness of subdivision is amazing. A slip of ivory, of an inch in length, has frequently a hundred equal parts marked on it, all being distinctly visible. Nobert, a Pomeranian optical instrument maker, is renowned for producing the finest rulings on glass which have hitherto been executed. These test plates, as they are called, contain a number of bands, the coarsest of which in his 20-band plate contains 11,259 spaces to the inch, and the finest, 225,187. Yarn has been spun so fine that one pound of it extended 4,770 miles.

The gold-beaters begin with a ribbon an inch broad and 150 inches long, which has been reduced by passing through rollers, to about the 800th part of an inch in thickness. This ribbon is cut into squares, which are disposed between leaves of vellum, and beat by a heavy hammer till they acquire a breadth of more than three inches, and are therefore extended 10 times. These are again quartered, and placed between the folds of gold-beaters' skin, and stretched out, by the operation of a lighter hammer, to the breadth of five inches. There seems almost no limit to the gold-beater's skill in dividing his tissue of gold, for one grain of gold has been beaten out to a surface of 52 square inches, and leaves have been made 307,500 of which would go to the inch. Iron, the least malleable of the above-mentioned metals, has been reduced to wonderfully thin sheets. Fine tissue paper is about the 1,200th part of an inch in thickness, but at the exhibition of 1851, Gillott, the steel penmaker, exhibited rolled sheets of iron the 1,800th part of an inch in thickness. Since then a sheet has been produced with an area of 55 inches, weighing but 20 grains, and having a thickness of 1-4800th part of an inch.

It has been asserted that wires of pure gold can be drawn of only the 4,000th part of an inch in diameter. But Dr. Wollaston, by an ingenious invention, obtained wires of platinum much finer than this, some of them only the 30,000th part of an inch in diameter. Such excessive fineness is hardly surpassed by the filamentous produc-

tions of nature. Human hair varies in thickness from the 250th to the 600th part of an inch. The fibre of the coarsest wool is about the 500th part of an inch in diameter, and that of the finest only the 1,500th part. The silk line, as spun by the worm, is about the 5,000th part of an inch thick; but a spider's line is perhaps six times finer, or only the 30,000th part of an inch in diameter; insomuch that a single pound of this attenuated substance might be sufficient to encompass our globe. A single grain of sulphate of copper will communicate a fine azure tint to five gallons of water. Odors are capable of a much wider diffusion. A single grain of musk has been known to perfume a large room for the space of 20 years. Some germs are almost inconceivably minute. Thus the germ known as *micrococcus* is a minute spherical body sometimes no greater in diameter than the 32,000th of an inch. The minute organisms to which the name of *bacteria* is specially applied are rod-shaped bodies about 1,000th of an inch in length. Many of the so-called infusorial animalcules are so exceedingly small that myriads of them may exist in a drop of water.

Division, in mathematics, the dividing of a number so as to discover how many times a lesser number is contained in it; one of the four fundamental rules of arithmetic. The number to be divided is the dividend, the number which divides is the divisor, and the result of the division is the quotient. Division is the converse of multiplication.

In military matters the section of an army consisting of two or more brigades, composed of the various arms of the service, and commanded by a general officer. In the navy, a select number of ships in a fleet or squadron of men-of-war. In deliberative legislation the mode of determining a question at the end of a debate. In the House of Representatives at Washington, a division has no traditional formalities, being determined by the rules of the body itself. In the Senate, a division is accomplished by a roll call. In the British House of Commons the speaker puts the question, and declares whether in his opinion the "ayes" or the "noes" have it. Should his opinion not be acquiesced in by the minority, the house is cleared, and the "ayes" directed to go into the right lobby and the "noes" into the left, where they are counted by two tellers appointed for each party. In the House of Lords the two sides in a division are called "contents" and "not-contents."

Division of Labor, in economics, a theory based on the principle that industry can be best carried on when each man has a special work to do. Constant practice in doing the same thing leads to a perfection which could not otherwise be attained. The classical illustration of it in the history of political economy is that of pin-making as given by Adam Smith: "One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business; to whiten the pin is another; it is even a trade by itself to put them into a paper; and the important business of making a pin is in this manner divided into above 18 distinct operations, which in some manufactories are all performed by distinct hands." In this way 10 men could make about 48,000 pins in a day, whereas, if they worked separately and independently, they certainly could not each of them have made 20, perhaps not one pin in a day. Adam Smith offers the following reasons why the division of labor secures greater efficiency: "First, the increase of dexterity in every particular workman; secondly, the saving of the time which is commonly lost in passing from one species of work to another; and lastly, the invention of a great number of machines which facilitate and abridge labor, and enable one man to do the work of many." Economists believe, however, that Smith has laid too great stress on both the second and third of the above reasons.

In biology, a conception borrowed from economics and introduced into biology by Milne-Edwards to describe the difference of function exhibited by the individual members of an animal colony, or by the different organs, tissues, and cells of a single organism. The figure of a hydroid colony, *Hydractinia*, shows how members, primarily and fundamentally the same in structure, become set apart as nutritive, reproductive, sensitive, and protective. The same division of labor or predominance of special functions in different individuals is beautifully illustrated in the *Siphonophora*.

Divitiā'cus, chief of the Ædui, often mentioned in the 'Commentaries of Cæsar.' He was a constant adherent of the Romans, and on one occasion made a visit to Rome, where he became the guest of Cicero, who mentions him in his book, 'De Divinatione,' as belonging to the order of the Druids, and professing much knowledge of the mysteries of nature and the art of divination.

Divorce, the disruption, by the act of law, of the conjugal tie made by a competent court on due cause shown. In the United States, jurisdiction in divorce cases is usually conferred on the law courts by the statutes in the different States. The causes of divorce enumerated in these statutes are by no means uniform in relation to the various States, and are more numerous in many of the western States than in the eastern. In most of the States divorce may be granted on any of the following grounds: adultery, conviction of felony, cruel and inhuman treatment, wilful desertion for periods varying from one to three years, habitual drunkenness, impotency, or neglect to support the wife. In New York adultery is the only cause of absolute divorce. In South Carolina the courts have no power to grant divorce, strictly speaking, the legislature being the only authority for that purpose. In both of these States, as in others, the courts may declare an alleged marriage invalid on grounds which rendered the parties or either of them incapable of contracting it, such as idiocy, lunacy, former husband or wife living, etc. Separation from bed and board, commonly called limited divorce, is granted on the ground of cruel and inhuman treatment; or desertion and refusal to support by the husband may be a ground for a decree setting the wife free from the interference and control of her husband, though it may not sunder the marriage tie.

A person applying for a divorce will not be allowed to obtain judgment should it appear that he or she has been guilty of the same offense, or that there is collusion between the persons concerned in order to procure a divorce; for

the same reason the plaintiff is always required to prove the existence of the grounds of divorce by satisfactory evidence, even though no contest is made on the other side. Parties also who have condoned the offense, that is, who, after it has been discovered, have consented again to live as husband and wife, are not allowed to obtain a divorce, but a second act of the same nature revives the right of action on the original offense.

The want of harmony in the legislation of the different States on this subject has led to very great confusion and conflict in regard to the rights and liabilities growing out of divorce against non-residents of the State where granted, and some uniform system of laws on the subject is greatly needed. As the jurisdiction of Congress over the subject is doubtful, uniformity can apparently be secured only by an amendment to the Constitution of the United States, or by the concurrent action of the various State legislatures.

By a late report made to Congress by Carroll D. Wright, commissioner of labor, on the subject of marriage and divorce, it appears that the whole number of divorces granted in the United States for a period of 20 years, commencing with 1867, was 328,716, of which 30,072 were granted in Illinois, 25,193 in Indiana, 15,355 in New York, 8,542 in Connecticut, 2,642 in New Jersey, and 163 in South Carolina. The ratio of marriages to one divorce for the same period was lowest in Rhode Island, being 11.11 marriages to each divorce. The cause for which the greatest number of divorces were granted was desertion, divorces on this ground numbering 120,557, or over 38 per cent of the whole number of divorces granted.

The differences in the divorce laws in the States account somewhat for the differences in the number of divorces granted in certain States. A large number of the divorces granted in some of the western States, where high divorce rates prevail, have been obtained by persons residents of other States before the statutory limit of time necessary for a residence in a State, which must elapse before beginning proceedings for a divorce. There are more divorces, in proportion to the population, granted in the United States than in Europe. The number of divorce courts in the United States will account in a great measure for this difference; about each county court, except in New Mexico, New Jersey, and South Carolina, or about 2,921 courts, have the power of granting divorces. There is but one divorce court in England, 28 in Germany, and 79 in France. Canada has few applications for divorce. In the 21 years ending with 1888, 94 divorces had been granted in Nova Scotia and New Brunswick together, and 41 in all the rest of the Dominion of Canada.

In England, the divorce court is composed of a judge ordinary, the three chiefs in the courts of common law, and three puisne judges. It is provided that either spouse may obtain a divorce on the ground of adultery, but in case the wife is petitioner the adultery must be accompanied by cruelty or desertion. By another act the power to pronounce a decree of divorce, which was at first reposed in the whole court, is given to the judge ordinary sitting alone; but in this case the decree so pronounced is a decree *nisi* and cannot become final for at least six months. After a decree of divorce the offending person is free to marry again, even with the paramour. But it is also enacted that no clergyman shall be compelled to solemnize the marriage of any person who has been divorced. He must, however, allow another clergyman, if willing to do so, to perform the marriage. The same general rules as to collusion, condonation, the conduct of the parties, etc., which obtain in the United States are law also in England. In order to guard against fraud by parties conniving to procure a divorce, power is given to the queen's proctor to interpose, in case he has reasonable grounds to suspect collusion or recrimination, in order to oppose a petition for divorce. By these acts parties are also entitled to obtain a judicial separation on the ground of adultery, cruelty, or desertion. Judicial separation is declared to be in place of a separation "a mensa et thoro." A married woman, having obtained decree of judicial separation, is declared to be in all respects as a "femme sole" in regard to any property that she has or may acquire. Even before obtaining a separation a woman deserted by her husband may obtain from the court a protection for any property that she has or may acquire by her own industry.

In France there has been great opposition to any laxity in the divorce laws, but since the year 1884 French law has recognized three grounds of divorce: (1) adultery; (2) outrage, cruelty, or previous injury; (3) conviction of an infamous crime. These causes of action are equally available to husband or wife; but it is provided that the wife shall not marry again till after the expiration of 10 months from the date of the dissolution of the previous marriage. It is further provided that, in cases where divorce is sought on the ground of outrage, cruelty, or grievous injury, immediate divorce shall not be granted, but the parties may be granted separation for a year, with due provision for the wife's support during that time, at the end of which a final divorce may be granted if they have not been reunited in the meantime. Substantially the same rules as to condonation prevail as in the United States. All the proceedings necessary in such cases are carefully provided for by the code civil, as well as the consequences to the parties personal or proprietary.

In Germany, the question of divorce gave rise to a long contest. The General Prussian Code permitted divorce on the ground of mutual consent and deep-seated aversion, but on account of the newly-awakened religious life in the 19th century there was a strong opposition; this under Friedrich Wilhelm IV. arose to an overwhelming power. Many attempts were made to establish the laws of divorce on other bases, but on account of the personal antagonism of Friedrich Wilhelm IV. they remained without result. The demand for a biblical ground of divorce was fulfilled by the state, because the Bible does not offer a genuinely comprehensive ground of separation. It was considered that the Prussian law of divorce was lax and capricious and there was a unanimous demand for a more strenuous law in the interest of morals. This demand found recognition even in circles which were most opposed to ecclesiastical influence in politics. The opposing elements were reconciled by the personal influence of Wilhelm IV.; nevertheless the attempts of the legislatures to make a new regulation of divorce remained without results. At the present time attempts are being made for bringing about a common divorce law

for all of Germany. This proposed law rests theoretically on very strict principles which find justification in the motives. The Austrian code of common law allows to non-Catholic Christians separation from the bonds of matrimony on account of adultery, malicious desertion, five years' imprisonment, or on account of dangerous diseases, and repeated cruelty of treatment and invincible aversion.

Among the Jews: The enactment of the Mosaic law was the following: "When a man hath taken a wife, . . . and it come to pass that she find no favor in his eyes because he hath found some uncleanness in her, then let him write her a bill of divorcement, and give it in her hand and send her out of his house" (Deut. xxiv. 1). Here, it will be perceived, impurity is the only assigned cause for such divorce. The woman sent away might marry another man, but if he, too, divorced her, it was not permitted her first husband to take her again. The word "uncleanness" in the passage now quoted is a free translation: the Hebrew words mean literally "the nakedness of a thing." The exact import of this expression was sharply contested in the immediately pre-Christian times, the school of Hillel giving it a general meaning, and holding that a man might divorce his wife for the most trivial cause; while that of Shammai considered that the doubtful phrase signified adultery, for which therefore alone a man could put away his wife.

The Mohammedan law of divorce, founded on some passages in the Koran, allows of a separation by mutual consent, giving the wife the right of retaining her marriage portion, unless she agrees to relinquish a part of it as the price of the separation. The parties are permitted to separate and re-unite twice, if they can so agree without any particular conditions; but after the third divorce the husband is not permitted to receive his wife again until she shall have previously married another husband. The act of divorce is a judicial proceeding before the cadi, who does not decree it until three months after the application.

The Hindu and Chinese laws of divorce show little regard for women, and not only the causes recognized in European and American countries, but others are deemed sufficient for a husband to discard his wife.

The different Grecian states had each their respective laws of divorce. At Sparta they do not seem to have greatly regarded the delicacy of the marriage bed when the interest of the republic was in question; but divorces appear to have been rare, since the *ephori* fined Lysander for repudiating his wife. At Athens either the husband or wife might procure a divorce by exhibiting a bill for this purpose to the archon, and obtaining the verdict or consent of a jury to whom the question was referred. But the party applying must, it seems, have made application personally; and Alcibiades, according to Plutarch, took advantage of his authority as a husband to prevent his wife from making the application personally; for when she was going from her brother's house, where she had taken refuge, to the archon's to sue for a divorce, he forcibly seized upon her, and confined her to his own house.

The early laws of Rome permitted the husband to divorce his wife for poisoning his children, counterfeiting his keys, or adultery. But other causes were afterward added; for the first divorce recorded was for the sterility of the wife. This was by Sp. Carrilius Ruga, about 230 B.C. Divorces afterward became very frequent, and a law was, on this account, made by Augustus, requiring additional ceremonies in a divorce; among other things, the presence of seven witnesses to the act of dissolution of the marriage. By the Theodosian code the husband could divorce the wife for adultery, or if she was a witch or a murderess, had sold a free-born person into slavery, violated a sepulchre, committed sacrilege, been accessory to theft or robbery, was given to feasting with strangers without the knowledge or against the wishes of the husband, lodged abroad without good reason, or frequented theatres and shows, her husband forbidding, or was aiding and abetting in plots against the state, or dealt falsely, or offered blows. The wife had equivalent rights in this respect, for she could procure a divorce on similar charges against her husband. He could be re-married immediately; she, not within a year.

The facility of divorce continued, without restriction, under the Roman emperors, but as the modern nations of Europe emerged from the ruins of the Roman empire, they adopted the doctrine of the New Testament (Matt. xix. 6), "What God hath joined together, let not man put asunder."

Divorce, under the laws of the Roman Catholic Church is never allowed where the marriage has been duly contracted, ratified, and consummated. But a perfectly valid marriage contracted between baptized persons can be annulled by the Pope, before its consummation, never after consummation. It is held by canonists that a marriage lawfully and validly contracted but not consummated is annulled by either of the parties taking solemn life-time vows of continence and entering a religious order. If of two unbaptized persons, married, one is converted to the faith and receives baptism, he or she may be released from the marriage bond if the other party refuse to live peaceably and without insult to the Christian religion in the marriage state; and then the released party can marry again. Outside of such conditions as have been stated Christians united in marriage cannot in the Roman Catholic Church be freed from the marriage bond, *vinculum matrimonii*, save after the death of one or other of them. See MARRIAGE AND DIVORCE.

Divorce, Court of. See COURT.

Dix, Beulah Marie, American novelist: b. Massachusetts 1876. She has published: 'Hugh Gwyeth' (1899); 'Soldier Rigdale' (1899); 'The Making of Christopher Ferringham' (1901); 'The Beau's Comedy' (with C. A. Harper, 1902); 'A Little Captive Lad' (1902); 'Blount of Breckenhow' (1903).

Dix, Dorothea Lynde, American philanthropist: b. Hampton, Maine, 4 April 1802; d. Trenton, N. J., 19 July 1887. In her youth she supported herself by teaching in Worcester, Mass., but in 1830 fell heir to some property, after which she devoted her life to the relief and betterment of lunatics, paupers, and criminals. She visited the prisons, asylums, and almhouses of nearly every State in the Union, and by her efforts contributed largely to the establishment of lunatic asylums in those States which had none. She also traveled extensively in Eu-

rope in the same service and her efforts materially improved the condition of the insane there, likewise. She published several children's books, and in 1845 'Prisons and Prison Discipline.' In 1993 a bill was favorably received in Congress appropriating $10,000 for a monument to her at her birthplace. The report of the House Committee declares: "Miss Dix occupies a conspicuous place in history as a philanthropist. Certainly no other woman in modern times has done more to earn the gratitude of the people of this country than this self-sacrificing and devoted woman. Her services during the Civil War as chief of the hospital nurses of the United States and her wonderful success in establishing institutions for the insane — over 30 in number — in the South and West and elsewhere in the country, place her among the noblest examples of humanity in all history." Consult Tiffany, 'Life of Dorothea Lynde Dix' (1890).

Dix, Edwin Asa, American author: b. Newark, N. J., 25 June 1860. He was graduated from Princeton University in 1881; studied law at Columbia College Law School; and was admitted to the bar in 1884. He served as literary editor of 'The Churchman' for a time, and is the author of 'A Midsummer Drive Through the Pyrenees'; 'Deacon Bradbury'; a novel; 'Champlain, The Founder of New France'; and many short stories, sketches, and travels.

Dix, John Adams, American statesman and soldier: b. Boscawen, N. H., 24 July 1798; d. New York 21 April 1879. In 1812 he was appointed a cadet in the United States army, and in 1813, ensign. He took part in the operations on the Canadian frontier during the War of 1812; afterward studied law and was admitted to the bar in Washington. In 1826 he was sent as a special messenger to the court of Denmark. He resigned from the army in 1828, and began practising law in Cooperstown, N. Y. Later he was secretary of state and adjutant-general of New York, and was prominently associated with the "Albany Regency," the controlling power of the Democratic party. In 1841 he was elected to the State assembly, and in 1845–9 was a United States senator. In 1861 he was appointed secretary of the treasury by President Buchanan. At this time there were two revenue cutters at New Orleans, and he ordered them to New York. The captain of one refused to obey his order, and Dix telegraphed to put him under arrest, adding the statement which has made him famous, "If any one attempts to haul down the American flag, shoot him on the spot." At the outbreak of the Civil War, he was elected president of the Union Defense Committee, and organized 17 regiments. He was commissioned a major-general of volunteers, and through his active measures saved Maryland to the Union cause. He was elected governor of New York in 1872, but was defeated on a renomination in 1874.

Dix, Morgan, American Episcopal clergyman: b. New York 1 Nov. 1827. He is a son of J. A. Dix (q.v.). He was graduated from Columbia College in 1848 and from the General Theological Seminary in 1852. He then took orders in the Episcopal Church and after serving for a few years as assistant in Trinity Church, New York, became in 1862 the rector of Trinity parish. In November 1902 the 40th anniversary of his rectorship was celebrated. To the rector of the leading Episcopal church in New York there ever presents itself a great opportunity, and of this opportunity Dr. Morgan Dix has made the best use. Under his wise guidance he has seen Trinity grow in size and power, until to-day the power wielded by its rector is second only to that of the bishop. It has been said of him that "he nominates his own assistants independently of the bishop of the diocese" and that "he presides directly over one ninth of the entire diocese and one fifth of the Episcopalians in Manhattan." Prior to 1901 he had been president of the House of Clerical and Lay Deputies in many successive general conventions of the Episcopal Church. He has published: 'Commentary on the Epistle to the Romans' (1864); 'Exposition of the Epistles to the Galatians and Colossians' (1865); 'Lectures on the Pantheistic Idea of an Impersonal Substance Deity' (1865); 'Lectures on the Two Estates' (1872); 'Memoirs of John A. Dix' (1883); 'The Sacramental System' (1893); 'History of the Parish of Trinity Church' (1899–1901).

Dixey, Henry E., American actor: b. Boston, Mass., 6 Jan. 1859. His earliest success was in the comedy of 'Adonis,' and he has since played many comic parts.

Dixie, Lady Florence Caroline Douglas, English explorer, poet, and novelist: b. London 24 May 1857; d. 7 Nov. 1905. She explored Patagonia 1878–9, was war correspondent for the London *Morning Post* in the Boer war 1880–1, and was instrumental in securing the liberty of Cetawayo, king of Zululand. She published: 'The Songs of a Child and Other Poems'; 'Across Patagonia'; 'In the Land of Misfortune'; 'A Defence of Zululand and Its King'; 'The Child Hunters of Patagonia'; 'Aniwee or the Warrior Queen'; 'Gloriana'; 'Redeemed in Blood'; 'Little Cherie'; 'Ijain, or the Evolution of a Mind'; 'Isola,' a drama; 'Two Castaways'; etc.

Dixie, a name associated in negro minstrelsy with the Southern States. It is supposed to be derived from the name of one Dixie, a large-holding and kind-hearted slave-owner on Manhattan Island in the latter part of the 18th century. His treatment of his negroes caused them to regard his plantation (or "Dixie's") as little short of an earthly paradise, and when any of the slaves were taken away from home they always pined for "Dixie's," while singing and talking of its joys. When slavery moved southward in search of a more secure and congenial habitat, the same ideal of "Dixie's" was taken along, and the chant which the former slaves of Dixie sang of their old home became so widespread that its origin was lost sight of and it came to be applied to the southern homes of the negroes.

In fact in the South "Dixie" is held to mean the Southern States, the word being regarded as a derivation and corruption of "Mason and Dixon's line," (q.v.) which originally divided the free and slave States, and supposed by the Southerners to have first come into use when Texas joined the Union and the negroes frequently sang of it as "Dixie."

Dixon, Charles, English naturalist: b. London, England, 20 July 1858. His entire life has been devoted to natural history study, bird migration and the geographical distribution of species having been his especial field. His pub-



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lished books include 'Rural Bird Life' (1880); 'Evolution without Natural Selection' (1885); 'Our Rarer Birds' (1888); 'Stray Feathers from Many Birds' (1890); 'Annals of Bird Life' (1890); 'Idle Hours with Nature' (1891); 'The Birds of Our Rambles' (1891); 'The Migration of Birds' (1892); 'Jottings About Birds' (1893); 'Game Birds and Wild Fowl of the British Islands' (1893); 'Nests and Eggs of British Birds' (1893); 'Nests and Eggs of Non-indigenous British Birds' (1894); 'The Migration of British Birds' (1895); 'British Sea Birds' (1896); 'Curiosities of Bird Life' (1897); 'Our Favorite Song Birds' (1897); 'Lost and Vanishing Birds' (1898); 'Bird Life in a Southern Country' (1899); 'Among the Birds in Northern Shires' (1900); 'The Story of the Birds' (1900); 'Birds' Nests' (1902); 'A Popular History of Birds' (1902).

Dixon, Frank Haigh, American educator: b. Winona, Minn., 8 Oct. 1869. He was graduated at the University of Michigan 1892, and has been assistant professor of economics in Dartmouth College since 1898, and secretary of the Amos Tuck School of Administration and Finance since 1900. He has published 'State Railroad Control.'

Dixon, James, American lawyer and statesman: b. Enfield, Conn., 5 Aug. 1814; d. Hartford, Conn., 27 March 1873. He was graduated at Williams College, and achieved distinction in the practice of the law, but turning his attention to public affairs, was repeatedly elected to the Connecticut legislature as a Whig, served two terms in the United States House of Representatives, and was a member of the United States Senate from 1857 to 1869.

Dixon, James Main, American educator: b. Paisley, Scotland, 20 April 1856. He was educated at the University of St. Andrews, was professor of English in the Imperial College of Engineering, Japan, 1879–86; professor of English in the Imperial University of Japan 1886–92, and professor of English literature in Washington University 1892–1901. He has published 'A Dictionary of Idiomatic English Phrases' (1891), and is joint author of an 'Illustrated History of Methodism' (1900).

Dixon, Joseph, American inventor: b. 1799; d. 1869. He was at various times shoemaker, printer, wood engraver, and physician, and establishing crucible works in 1827 at Salem, Mass., became very wealthy. In the course of his experiments he devised important improvements in philography, smelting, bank-note printing, etc.

Dixon, Richard Watson, English clergyman and author: b. London 1833; d. 2 Jan. 1900. He was educated at Oxford; was master in the high school at Carlisle in 1863, and canon of Carlisle in 1874. He became vicar of Hayton in 1873 and of Warkworth in 1883. He published: 'Christ's Company and other Poems' (1861); 'Historical Odes and other Poems' (1864); 'Mano, a Poetical History' (1883); 'Odes and Eclogues' (1884); 'Lyrical Poems' (1885); 'The Story of Eudocia and Her Brothers, a Narrative Poem' (1887); 'Songs and Odes' (1896); 'Essay on the Maintenance of the Church of England' (1875); 'Life of James Dixon' (1874); and 'History of the Church of England from the Abolition of the Roman Jurisdiction' (1880–1900). He was associated with Burne-Jones, Rossetti, and Morris, in founding the 'Oxford and Cambridge Magazine,' the chief organ of the pre-Raphaelite school.

Dixon, Thomas, Jr., American novelist and clergyman: b. Shelby, N. C., 11 Jan. 1864. He was graduated at Wake Forest College, N. C., 1883, and Greensboro, N. C., law school 1886, and admitted to the bar in the last-named year. After serving from 1884-86 as member of the legislature in North Carolina he resigned to enter the Baptist ministry. He was pastor in Raleigh, N. C., 1887; Boston, Mass., 1888–9, and New York 1889–99. Among his works are: 'Living Problems in Religion and Social Science' (1891); 'What is Religion?' (1892); 'Sermons on Ingersoll' (1894); 'The Leopard's Spots' (1902); 'The One Woman' (1903); 'The Clansman' (1904).

Dixon, William Hepworth, English author: b. Manchester 30 June 1821; d. London 27 Dec. 1879. In 1849 he published a memoir of Howard the philanthropist, followed by the 'Life of William Penn' (1851), and by a work on Admiral Blake (1852). In 1853 he became chief editor of the 'Athenæum,' a post which he retained till 1869. During this period he published several very popular works, including the 'Personal History of Lord Bacon,' 'The Holy Land,' and 'New America,' followed by 'Spiritual Wives.' After his retirement from the 'Athenæum,' he wrote some 25 volumes of history, travel, and fiction, among others, 'Free Russia'; 'Her Majesty's Tower'; 'The Switzers'; 'History of Two Queens, Catharine of Aragon and Anne Boleyn'; 'Royal Windsor.'

Dixon, William MacNeill, English scholar: b. India 1866. He was educated at Trinity College, Dublin, and has been professor of English literature and language in the University of Birmingham from 1894. He has published: 'English Poetry from Blake to Browning'; 'A Tennyson Primer'; 'In the Republic of Letters'; 'History of Trinity College, Dublin.'

Dixon, Ill., county-seat of Lee County, situated on the Rock River, about 65 miles above its junction with the Mississippi River, and on the Illinois C., and the Chicago & N. W. railroads. The manufactures of the city are agricultural implements, wagons, shoes, and condensed milk. It is the seat of one of the normal schools of Illinois. Pop. (1900) 7,917.

Dixon Entrance, a strait on the west coast of North America, separating Queen Charlotte Islands from the Prince of Wales Archipelago, and so dividing British territory from a part of Alaska.

Dix'well, John, English regicide: b. 1608; d. 18 March 1689. After the reaction in England which placed Charles II. upon the throne, and caused himself and his associates to be condemned to death, he escaped to America, changed his name, taking that of John Davids, and lived undiscovered among the inhabitants of New Haven, where he was married and left children. In 1664 he visited two of his fellow regicides, Whalley and Goffe, who had found a refuge amid the solitudes of Hadley, Massachusetts. His favorite study in exile was Raleigh's 'History of the World,' and he cherished a constant faith

that the spirit of liberty in England would produce a new revolution.

Dizful, dēz-fool', Persia, capital of the province of Khuzistan, about 100 miles west of Ispahan, on the river Diz. It has over 35 sacred tombs, and nearly as many mosques; but on account of the heat half the town consists of subterranean excavations in the rock. Pop. about 25,000.

Djezzar, jĕz'zär ("butcher"), the name given to Achmed Pasha; b. Bosnia about 1735; d. Acre 1804. He was famous for his obstinate defense of Acre against Napoleon I. He rose, through murder and treason, from the condition of a slave to be Pasha of Acre. In the beginning of 1799 the French entered Syria from Egypt, and advanced from victory to victory till they reached Acre, which was laid siege to on 20 March. By advice of Sir Sidney Smith, Djezzar was induced to hold out; and such was the savage doggedness of his defense that Bonaparte was obliged to retire on 21 May.

Djokdjokarta, dyŏk-dyō-kär'tä, or **Najoedjijo-karto**, a residency on the island of Java, with a capital of the same name. Its only high mountain, the volcano Merapi, is 3,150 feet high. It has no large river. Its forests abound in djatti (teak) wood. It was once an independent kingdom, but it is now controlled by the Dutch. Pop. 441,800. The town is the seat of the native sultan and of a Dutch resident. Pop. 45,000.

Dnieper, nē'pĕr (Russian, Dnjepr, dnyĕp'-ĕr; ancient Borysthenes), a river of Russia which rises in the government of Smolensk, flows south to Kiev, then southeast to Ekaterinoslaff, then south to Androosk, then southwest to the Black Sea. Below Ekaterinoslaff are the famous rapids through which boats must be guided by pilots, and which can be passed only at full tide. The Dnieper begins to be navigable a little above Smolensk. Its total length is 1,230 miles.

Dniester, nēs'tĕr (Russian, Dnjestr, dnyĕs'tĕr; the ancient Tyras; later Danastris or Danastus); a large river of Europe, which has its source in a lake in the Carpathian Mountain, in Austrian Galicia, and flows into the Black Sea, between Ovidiopol and Ackerman. Its length is over 800 miles; and its course is mostly through Russia. Only when the water is very high can ships of small burden ascend as far as Bender.

Doab, doo'ăb (Sanskrit, "Two Waters"), a name in Hindu applied indiscriminately to any tract of country between two rivers. The tract between the Ganges and the Jumna is usually called the Doab; other similar tracts have their distinctive name, as the Bari Doab, between the Bias and Ghara and the Ravi; the Rechna Doab, between the Ravi and the Chenab; and other places.

Doak, Samuel, American Presbyterian clergyman: b. Augusta County, Va., 1 Aug. 1749; d. Bethel, N. C., 12 Dec. 1830. He was graduated from Princeton; was for a time tutor in Hampton Sidney College; and was licensed to preach in 1777. He first settled at Holston, and later at Salem, Tenn., where he built a small church, formed the Salem congregation, and established a school, the first organized in the Mississippi valley. It was incorporated in 1785 as Martin Academy, and in 1795 became Washington College; Doak was its president from 1795 to 1818. He then removed to Bethel, where he founded Tusculum Academy.

Doane, George Hobart, American Roman Catholic clergyman: b. Boston, Mass., 5 Sept. 1830; d. Newark, N. J., 20 Jan. 1905. He was graduated at Jefferson Medical College in 1850, became a deacon in the Protestant Episcopal Church, but later entered the Roman Catholic Church and was ordained priest in 1857. In 1873 he was made vicar-general of Newark, N. J., and in 1886 the Pope made him a domestic prelate with the title of Monsignore. He wrote: 'First Principles'; 'Exclusion of Protestant Worship from Rome'; etc.

Doane, George Washington, American Episcopal bishop: b. Trenton, N. J., 27 May 1799; d. Burlington, N. J., 27 April 1859. He was educated at Union College, and was one of the first six students at the General Theological Seminary in New York. He was ordained deacon in 1821 and priest two years later, having become in the meantime an assistant in Trinity Parish, New York. Here he remained until 1825, when he was appointed professor of rhetoric and belles-lettres in Washington (now Trinity) College, Hartford. This position he held for three years, going then to Boston as assistant and afterward rector of Trinity Church. In 1832 he was consecrated bishop of New Jersey, and took up his residence in Burlington, N. J., combining the rectorship of St. Mary's Church with the episcopate until his death. Besides a vigorous prosecution of general religious work in his diocese, he devoted himself especially to the promotion of Christian education. In 1837 he founded St. Mary's Hall, a boarding and day school for girls, at Burlington, and in 1846 organized Burlington College in the same town. His zeal in this direction, combined with incomplete knowledge of business principles, led to financial embarrassment and ultimately to presentment for trial before his brother bishops; but the charge was unanimously dismissed. In many ways Bishop Doane was far in advance of his time, advocating daily services and the free church system when they were practically unknown in America. He left a large number of published sermons, lectures, and essays, and was also a poet of no mean ability, his best-known poem being that beginning 'What is That, Mother?'

Doane, William Croswell, American Protestant Episcopal bishop: b. Boston 2 March 1832. He is a son of G. W. Doane (q.v.). He was ordained deacon (1853) and priest (1856) in St. Mary's Church, Burlington, N. J., serving as assistant there until the latter date, when he took charge of St. Barnabas' Church Burlington. He succeeded his father in the rectorship of St. Mary's (1859–61), and after holding rectorships at Hartford, Conn. (1861–7), and Albany (1867–9), became in the year last named the first bishop of Albany, on the division of the large diocese of New York. In this position he has acquired a reputation as a wise and statesmanlike administrator, and has been a diligent promoter of religious education. St Agnes' School at Albany was founded by him. He took a prominent part in the second, third,

and fourth Lambeth Conferences, and in the discussions on the revision of the American prayer-book, to which his liturgical knowledge made valuable contributions. He is known as a firm believer in the cathedral system, and has spent much labor on its organization at Albany, including the erection of a magnificent cathedral. His most important literary work is his 'Life of Bishop George Washington Doane' (1860). He has published also: 'Mosaics, or the Harmony of the Collects, Epistles, and Gospels'; 'A Catechism of the Christian Year'; 'The Manifestations of the Risen Lord.'

Doane, William Howard, American composer: b. Preston, Conn., 3 Feb. 1831. He was chief editor of the Baptist 'Hymnal' and has composed numerous popular evangelistic hymns and songs. He has also published more than 20 collections of hymns and several cantatas. He early removed to Cincinnati where he has been president and general manager of a firm of manufacturers of wood-working machinery since 1861.

Doane College, in Crete (q.v.), Neb., a coeducational school, began its legal and corporate existence 11 July 1872. The college was the outgrowth of an academy organized in 1871, which virtually became the preparatory department of the college, which was named in honor of Thomas Doane, a generous benefactor. In 1893 the academy resumed its name, a principal was appointed, and special efforts were made to develop academic life. Doane College is the centre of a group of schools all under the auspices of the General Association of the Congregational Churches of Nebraska. The group is composed of four academies; one at Cnadron, in Dawes County, in the northwest part of the State; another at Neligh, in Antelope County, in the northeast; one at Franklin, in Franklin County, in the south; the fourth at Weeping Water, in Cass County, in the east; with Doane College, the head, at Crete, in Saline County. The motto of the college is, "We build on Christ."

The government of the college is vested in a board of trustees, consisting of 27 members, who are self-perpetuating. Each member serves three years but is eligible for re-election. Each class of graduates from the college names one of its number as a candidate for membership to the board of trustees, and such name is put on the eligible list. Three of the trustees are representatives of the Nebraska Congregational Churches.

The college courses are classical, literary, and scientific; and the degrees granted are A.B., B.S., and B.L. There are departments of music and art. In 1903 there were connected with the school 17 professors, and about 200 students. Connected with the system there were 700 students. The library contained 9,038 bound volumes and 5,673 pamphlets. The college owns 600 acres of land, 90 acres of which are in the campus, and 50 acres have been made into a park. Aid is furnished worthy and needy students. The endowment fund is $166,000, and the annual expenses are $18,000. The college is free from debt.

Dobbs Ferry, N. Y., a residential village in Westchester County, on the Hudson River, and on the New York C. & H. R. Railroad, 25 miles north of the city hall, New York. It is an interesting town historically, having been the scene of many important events in the Revolutionary War. The Yorktown campaign was planned in the Livingston house, and the first salute fired by a British war sloop to the American flag was given opposite this place. Pop. (1900) 2,888.

Dobereiner, Johann Wolfgang, yō hŏn vŏlf'gäng de'bĕ-ri-ner, German chemist: b. Hof, Bavaria, 15 Dec. 1780; d. Jena 24 March 1849. He was professor of pharmacy and chemistry at Jena for 39 years, and discovered the combustibility of platinum, the apparatus for utilizing which is known as Dobereiner's lamp (q.v.). He published 'Zur Pneumatischen Chemie,' and other works. His correspondence with Goethe and Charles Augustus of Weimar appeared in 1856.

Döbereiner's Lamp, a contrivance for producing an instantaneous light, invented by Prof. Dobereiner, of Jena, in 1824. The light is produced by throwing a jet of hydrogen gas upon recently prepared spongy platinum, whereupon the metal instantly becomes red hot, and then sets fire to the gas. The action depends upon the readiness with which spongy platinum absorbs gases, more especially oxygen gas. The hydrogen is brought into such close contact with oxygen (derived from the atmosphere) in the pores of the platinum that chemical union, attended with evolution of light, takes place.

Dobrizhoffer, dō'brĭts-hŏf-ĕr, **Martin,** a Jesuit missionary to the native tribes of Paraguay and author of a voluminous and celebrated memoir on the Abipones, a Paraguayan tribe: b. Gratz, Syria, 1717; d. Vienna 17 July 1791. At the age of 19 he entered the Jesuit order and in 1749, having been ordained priest, was assigned to the mission of Paraguay, in which he spent 18 years, returning then to Austria where he passed the remainder of his life, devoting his leisure to writing his memoir 'Historia de Abiponibus, etc.,' that is, 'A history of the Abipones, a cavalier and warlike people of Paraguay, enriched with copious observations on the barbarous natives, rivers, beasts, amphibia, insects, principal serpents, fishes, birds, trees, plants, and peculiarities of the said province.' A translation of the work (somewhat abridged) by Sara, S. T. Coleridge's daughter, was published in three large volumes (1822). Southey, in his 'Tale of Paraguay,' in complimenting Miss Coleridge upon the faithfulness of her translation of so voluminous a work, and one so full of difficulties for the translator, alludes to the Empress Maria Theresa's generous protection of the author after he and his order had been expelled by the Spanish government from South America and after the order had itself been suppressed by the Pope:

> And if he could in Merlin's glass have seen
> By whom his tomes to speak our tongue were taught,
> The old man would have felt as pleased, I ween,
> As when he won the ear of that Great Empress Queen.

Dobrovsky, dō'brŏf-skē, **Joseph,** Bohemian critic, historian, and philologist: b. Gyermet, Hungary, 17 Aug. 1753; d. Brünn 6 Jan. 1829. He was without a peer in Bohemian learning, ranking among the greatest philologists and critics with his 'History of the Bohemian Language and Literature' (1792); 'Principles of the Old Slavic Dialect' (1822); 'Grammar of the Bohemian Language,' and a wealth of simi-

lar works, all characterized by accuracy and sound judgment, and conferring unparalleled obligations on Bohemian letters.

Dobrudja, dō-bru'ja, or **Dobrudscha,** a territory forming part of the kingdom of Rumania, included between the Danube and the Black Sea. The principal town is Babadagh. Area, 6,102 square miles. Pop. 199,711.

Dobschau, dōb'show (Hungarian Dobsina), Hungary, town about 52 miles northwest of Miskolcz. Its industries comprise bee-culture, flax-growing, and the mining of copper, quicksilver, cobalt, nickel, and iron. It has a noted ice cavern. Pop. (1890) 4,643.

Dobson, Henry Austin, English poet: b. Plymouth 18 Jan. 1840. In 1856 he became a clerk in the Board of Trade, where he is now one of the officials known as principals. His earliest verses first appeared in the magazine called 'St. Paul's,' and were subsequently published in book form under the title 'Vignettes in Rhyme and Vers de Société' (1873). Since then he has published several other volumes of verse, including 'Proverbs in Porcelain' (1877); 'Old World Idylls' (1883); and 'At the Sign of the Lyre' (1885). Among his prose works may be mentioned his Lives of Fielding (1883); Steele (1886); Hogarth (1879); Goldsmith (1889); and Horace Walpole (1890); critical biography of William Hogarth (1891); 'Thomas Bewick and His Pupils' (1884); 'Four Frenchwomen' (1890); three series of 'Eighteenth Century Vignettes' (1892–6); 'A Paladin of Philanthropy' (1899); 'Sidewalk Studies' (1892). His collected poems were published in one volume in 1897. Many of his poems are written in various French forms, such as the rondeau and ballade, and all are marked by gracefulness, ease, and careful finish.

Dobson, William, English portrait painter: b. London 1610; d. Oxford 28 Oct. 1646. Having acquired considerable skill as a painter, he came under the notice of Van Dyck, who introduced him to Charles I. On the death of his patron he succeeded him as sergeant-painter to the king. Among his portraits are those of himself and his wife, Sir Charles Cotterell, Sir Thomas Browne's family, the first Duke of Newcastle, the Marquis of Montrose, Fairfax, and Old Parr; and in addition there are other pictures by him, the chief being 'The Beheading of St. John.'

Doce, dō'sā, a river of Brazil, rising by several streams on the eastern slopes of the Serra de Mantiqueira in the state of Minas Geraes, and flowing to the Atlantic, which it enters about 30 miles northeast of Santa Cruz. It is about 600 miles long, and is navigable up to 120 miles from its mouth.

Docetæ, dō-sē'tē, sectaries who held the human nature of Christ to be an illusion, phantasmal, and not real. The word is from the Greek verb δοκέω, to appear, to seem. The Docetæ were adherents of the Gnostic school and their peculiar dogma was held by a swarm of Oriental sects which preceded and outlived Arianism, both in the East and West. Their denial of the real humanity of Christ was made on the same ground on which Cerinthus (q.v.) denied that the universe is the creation of the principle of all good. That this view prevailed among sects in apostolic times is inferred from a passage in the first epistle of St. John: "Every spirit which confesseth that Jesus Christ is come in the flesh is of God; and every spirit which confesseth not Jesus is not of God."

Dock, a name applied to a large section of the genus *Rumex*, belonging to the buckwheat family (*Polygonaceæ*), chiefly those that are not acid. These are large perennial herbaceous plants, with stout roots, alternate, ovate, and often entire leaves, and bearing panicles of small greenish and usually perfect flowers in whorls. Their roots have an acrid taste, are astringent and styptic and are used in medicine. The root of the water-dock (*Rumex aquaticus*) makes a black color in a solution of sulphate of iron. This plant was greatly venerated by the Druids, who attributed to it miraculous qualities. Numerous species of this genus are known, some widely distributed over the northern hemisphere, 22 species being known in eastern and northern America.

Dock Warrant, a species of warehouse receipt given by a dock-owner to the owner of goods specified in dock warrant, and engaging to deliver them to owners or assignees. The Factor's Act in England has placed dock warrants on the same footing as bills of lading, and in many States of the American Union they have been declared negotiable by statute.

Docket, or **Docquet** (from "dock," to cut short, to abridge), in law, a term indifferently used for a summary of a larger writing; a small piece of paper or parchment containing the heads of a writing; an alphabetical list of cases in a court, or a catalogue of the names of the parties who have suits depending in a court.

Docks and Dock Yards, in the United States. Dock yards, dry docks, lift docks and marine railways are found on the Atlantic coast from Maine to Florida; on the Pacific from California to Washington; along the shores of the Great Lakes, and in the Philippines. On the Atlantic seaboard the most easterly harbor is Bath, Me., which has no dry docks, but a ship railway with a cradle 200 feet long. Extensive shipbuilding, however, is carried on in this city. The Bath Iron Works build and repair large hulls, engines and boilers, turn out shafts of any diameter up to 29 feet in length, and can make castings of 12 tons in weight. Besides the building of iron ships, wooden shipbuilding is carried on extensively at Bath, and most of the famed clipper ships that have made a name for American enterprise and commerce, and challenged the world in their fleet transit over the Atlantic, hailed from Bath, and today "Bath, Me.," is a very common inscription on the sterns of sailing ships.

Portland, at the head of an inlet, the largest city in Maine, has two wooden dry docks of the Simpson type; one being 415 feet long, with 23 feet of water over the sill, and a smaller one with a length of 200 feet. The Portland Company's Locomotive Works have large and heavy machinery suitable for repairing marine engines and hulls of vessels.

Near Portsmouth, N. H., the only seaport in the State, on Continental or Fernald's Island, is the Kittery Navy Yard. The famous U. S. S. Kearsarge was built at this station. Repairs of almost any extent can be made at this yard, and almost any kind of shipbuilding may be

done except the very largest. As a part of the plant, the government is now building a large concrete dry dock, about 750 feet in length over all. This dock will have sufficient capacity to take the largest battleships and merchantmen. The government has in addition a floating dock of 5,300 tons capacity.

Proceeding south the next point of interest is Massachusetts Bay and Boston. At Charlestown, a suburb of Boston, is located the Navy Yard, well equipped for making extensive repairs and for building large engines and ships. Besides the old granite dry dock, built in 1827, the government has now under construction a concrete dock about 750 feet in length over all, with 30 feet of water on the sills. At East Boston is located the plant of the Atlantic Works, covering about 12 acres of land. The largest ship that can be built and launched from the ways of this company is one of 3,500 gross tonnage; to build such ships and overhaul and make extensive repairs, the yard is fitted with a modern plant. This company operates three marine railways, the largest having a capacity of 2,000 tons. The Simpson Patent Dry Dock Company own three dry docks, one of which is 465 feet over all, with 19 feet of water on sill. Near Boston is the city of Quincy, where is located the Fore River Engine Company, with a plant for large and extensive shipbuilding. This company can build the largest class of ships, and is equipped to make the heaviest forgings required in marine work, shafts up to 40 inches in diameter can be turned and bored, and, up to 55 feet in length, can be bored without turning end for end. Although construction work is their chief industry, some repair work is done, and the company is now contemplating the construction of a floating dry dock of the largest size.

At Bristol, R. I., are located the famous shipyards of the Herreshoff Manufacturing Company, where most of the yachts were designed and built which have so successfully defended the America's Cup. Besides yachts, small ships are built at this yard.

At New London, Conn., once famous as a port from which whalers and sealing crafts hailed, is the home of the Eastern Shipbuilding Company, which concern recently launched the S. S. Minnesota, and is now building the S. S. Dakota, which will be launched in the fall of 1903, two of the largest steamships ever built. They are destined to be used in the Oriental trade, and are to ply from Seattle, Wash., to Japan and China. This company has no dry dock at the present time, but are contemplating the construction of some docks of very large capacity. The Morgan Iron Works are also located at New London. Their plant is designed for large and extensive repairs, and the construction work done at this plant is principally engines and boilers. A naval station located at New London is of little importance in so far as construction or repairs are concerned.

Between New London and New York there are no harbors or works of importance to shipping interests. At New York one finds an outer and inner harbor.

On the easterly shore of the inner harbor, and on the East River, the government has established the largest navy yard in this country. A thoroughly efficient and modern shipbuilding plant forms part of the equipment, and large ships can be built. The ill fated U. S. S. Maine was constructed at this yard. Three dry docks are now in commission, and a fourth one about 571 feet long is under consideration. The existings docks are: One granite dock 362.2 feet over all; one originally wood and recently reconstructed of concrete 491 feet over all, and finally a timber dry dock 658.9 feet over all. The largest ship in the navy can be docked here, and thoroughly overhauled and repaired. Besides the Navy Yard plant, New York harbor is well supplied with shipbuilding plants and shipyards. The largest private docks are owned by J. N. Robins Company, one being 510 feet over all, with 22 feet of water on the sill, and one 600 feet over all, with 25 feet of water on the sill. These two are built of wood of the Simpson type. This company owns several floating docks, the largest being 353 feet long with a lifting capacity of 6,000 tons. The J. N. Robins Company are concerned principally in making repairs, and almost any of the Trans-Atlantic ships can be docked at their yard. The Townsend and Downey Shipbuilding Company, located on Shooter's Island, between Staten Island and New Jersey, has facilities for building and repairing steel vessels, and have two marine railways capable of handling vessels of not more than 5,000 tons.

Near the mouth of Newark Bay, in Elizabeth, N. J., the Crescent Shipyard Company has established a plant where tug boats, oil barges, light draught river steamers, yachts, gunboats, torpedo boats, submarine boats, etc., etc., are built. The 345 foot steel car float for the Cape Charles route of the New York, Philadelphia & Norfolk line is the longest vessel constructed at this yard, with a 47 foot beam and a depth of 12½ feet. Another large vessel constructed here is the 3,200 ton U. S. S. Chattanooga. Not owning any docks of their own the Crescent Company make use of those belonging to the New Jersey Dry Dock & Transportation Company, also at Elizabeth.

At other points in New York harbor are located floating docks with a capacity sufficient to enable them to lift almost any of the vessels docking at New York, except the largest Trans-Atlantic liners. The principal ones being the Morse Shipbuilding Company in South Brooklyn, with a lift dock capable of handling vessels of not over 15,000 tons, and the Tietjen & Lang docks at Hoboken, with four lift docks for small repair work; also at Hoboken is located the W. A. Fletcher Iron Works, where are constructed and repaired boats of the class used in inland navigation of this country.

Near Philadelphia is located the League Island Navy Yard. This yard is well equipped to make all kinds of repairs, both large and small. The existing dry dock is 491.7 feet over all and has 25.5 feet of water over the sill. A concrete and granite dry dock is now in course of construction, 739.5 feet over all, with 30 feet of water on the sill. Cramps Shipyard, established in 1830, and the best known private yard in this country, is located in Philadelphia. Here most of the United States battleships were built. A large fleet of both naval and merchant ships were built at this yard. The Simpson dry dock of this company is 462 feet over all. Philadelphia is particularly well adapted to do repair work, and, if not the largest manufacturing city in the United States, the facilities for the con-

struction and repair of engines, boilers, etc., are unexcelled. Across the Delaware River at Camden, is located the New York Shipbuilding Company, who, with a modern yard, with covered shipways and the most up to date appliances, are capable of constructing and repairing vessels of any size. These works are still in their infancy, but they have a large capacity.

At Wilmington, Del., are located the Harlan & Hollingsworth Company, which can construct ships up to 450 feet in length, with proportionate beam, and equip same ready to go into commission. Their Simpson dry dock is 350 feet long, with 13½ feet of water over the sill. The yards are equipped not only to build, but to make extensive repairs.

At Baltimore large and extensive shipyards have been built in the vicinity on the Patapsco River. At this point the Baltimore Shipbuilding & Dry Dock Company have facilities for docking ships 437 feet in length, 45 feet in width and 22 feet in depth, their dock being 504 feet long on top, with 23 feet of water on the sill. The range of the tide is about one foot. The plant of this company is up-to-date, and they can handle both old and new work economically and with despatch. There are two large dry docks, one the property of the Columbia Iron Works & Dry Dock Company, 505 feet over all; the other 600 feet over all, belonging to William Skinner & Sons. There are also several machine shops and shipyards at this point, where large and extensive repairs can be made. The Columbia Iron Works & Dry Dock Company, the Enterprise Marine Engine & Boiler Works, the People's Machine & Boiler Works, and the Maryland Steel Company are all large works for repair and construction.

Newport News, Va., is the home of the Newport News Shipbuilding & Dry Dock Company, which has a large and extensive plant, where the largest ships, both naval and mercantile, can be built, overhauled and repaired. The two Simpson dry docks at this point are 610 feet and 827 feet, respectively, in length on top. Vessels up to 64 feet beam can be docked.

The Norfolk Navy Yard at Gosport, opposite Norfolk, Va., has a granite dock 319 feet 8 inches long, and a timber dock 491 feet over all. The shops at this yard are of sufficient capacity to build as well as to repair government vessels.

At Port Royal, S. C., the Navy Yard at this point has one timber dock 484 feet 6 inches long, of sufficient size to allow 10,200 ton ships of the class of the U. S. S. Indiana to be docked. This yard is only adapted to make repair work. At Pensacola, Fla., the government has a floating dry dock 201 feet 2 inches long. Moderate repairs can be made at this station. The works of Cosgrove & Company, and Cready & McClintock, where large repairs can be made, are also located here.

At New Orleans, La., there are two floating docks of 200 and 300 feet in length which can be used together to give a length on the keel blocks of 487 feet; the Johnson Iron Works, A. A. Mims, and the Whitney Iron Works do the work of repairs in conjunction with the docks. The U. S. Naval Station is situated at Algiers in the vicinity of New Orleans, where government has a steel floating dock 525 feet long. The yard is not well equipped to do any work excepting very small repairs.

The harbor of San Francisco, the largest city of the Pacific slope, is well supplied with yards and docks for construction and repairs of ships. The California Dry Dock Company has a stone dock cut in the solid rock at Hunters' Point, where the U. S. S. Oregon has been docked. This company, with the Risdon Iron Works, are well fitted to do the heaviest machine work. The dock referred to above is 490 feet long with a depth of 23 feet over the sill. The Union Iron Works in this city have a 440 foot steel hydraulic lift, with a 4,750 ton capacity. They are well adapted to build the largest ships, both naval and merchant. This yard was made famous as the builders of the 9,000 ton U. S. S. Oregon, which made the run around the Horn during the Spanish war, and arrived at the Cuban coast fit and ready to take part in the battle of Santiago. In addition to the hydraulic lift, this company operates 2 large graving docks, one 420 feet long, with 28 feet of water on the sill, the other 700 feet long, with 30 feet of water on the sill, and several smaller ones with a capacity of 1,200 to 1,600 tons.

The Naval Station of California is located at Mare Island. This station possesses two docks, one 510 feet 6 inches long, built of granite, the other 730 feet 6 inches long over all in course of construction of granite and concrete. The yard is equipped for large and extensive repairs with a 100 ton crane.

The only other dry dock of large capacity on the Pacific coast of the United States is the naval dock at Port Orchard, Wash., within the limits of the Puget Sound Naval Station. This dock is built of timber and is 640 feet long, with 30 feet of water on the sill. The largest ship which has been docked here is the U. S. S. Oregon, with a tonnage of 9,000.

A great development has taken place in recent years in the docking and shipbuilding industries along the shores of the Great Lakes. At West Superior, Wis., a large shipping business is done in wheat and ores, large elevators and coal docks handling the freight, which is shipped chiefly by water. The American Ship Barge Company have located their yards and dry docks at this point. These yards are of sufficient capacity to make extensive repairs to ships employed on the Lakes. The two docks of this company are 537 feet and 606 feet long, with 18 and 17 feet, respectively, depth of water over the sill.

At Marquette, Mich., the water front is lined with immense docks designed for handling the vast ore business of this region. It is not supplied with any dry docks, but the Lake Shore Iron Works, located here, build and make extensive repairs to machinery. At Sault Ste. Marie, located near the Ste. Marie Rapids on the Ship Canal, a large dry dock is contemplated. The Soo Ship Canal, built (1853) to avoid shooting the rapids, was reconstructed and enlarged in 1881. The largest lock, completed in 1896, is 800 feet long, and of sufficient depth over the sill to accommodate vessels of 21 foot draught. The pumps are of sufficient capacity to empty the lock in seven minutes.

At Milwaukee, Wis., there are several small timber dry docks 312 and 315 feet in length, with 15½ and 16 feet of water over the sills. Disabled vessels can secure ordinary repairs to machinery at the shops of the Vulcan Iron Works or the Milwaukee Boiler Works. The Vulcan Iron Works can turn out shafting 10

inches in diameter and 20 feet long, and can finish screws up to 14 feet in diameter. Their limit in castings is 13 tons.

Chicago is well supplied with dry docks and yards and shops where vessels can be repaired and thoroughly overhauled. The Chicago Shipbuilding Company owns the largest dry dock in the city; it is 525 feet over all, having a depth of water of 18 feet over the sill, and of sufficient capacity to dock lake steamers. Their shops and plant are large enough to make extensive repairs to the hulls and engines of vessels, and they further own an extensive shipbuilding plant, enabling them to build as well as overhaul the largest inland water vessels. The Marine Engine Works can make all ordinary repairs to engines, turn out shaftings 30 inches in diameter and 35 feet long, and make castings up to 20 tons in weight. The Samson Steam Forge Company turn out heavy forgings and finish same, and weld tubes up to two inches in diameter by electricity. There are, besides these, numerous boiler and machine shops where vessels may be thoroughly overhauled and repaired.

At Port Huron, Mich., a 412 foot over all timber dry dock, with 18 feet depth over the sill, affords sufficient capacity to receive the large lake steamers. The Dry Dock Iron Works and the Phœnix Iron Works repair machinery, engines and boilers. There is a floating dry dock in the harbor owned by the Wolverine Dry Dock Company, 210 feet long, with a lifting capacity of 1,000 tons.

Detroit has several large timber dry docks owned by the Detroit Dry Dock Company, the largest being 412 feet long over all and having 18 feet of water over the sill. This company owns a shipyard plant where wooden ships are built, and they make extensive repairs to machinery, engines and boilers. Shafting up to 12 inches in diameter can be made by this firm, and engines with L. P. cylinders 62 inches in diameter have been built at their works. The Eagle Iron Works also build machinery.

At Toledo, Ohio, the Craig Shipbuilding Company builds and repairs hulls and small engines, having no facilities for doing work of any great magnitude; they own, however, the largest dry dock in the city, it being 425 feet long over all, with 16 feet of water over the sill. The Eagle Machine & Iron Works and the Toledo Foundry & Iron Works build, overhaul and repair machinery. At Lorain, Ohio, the Cleveland Shipbuilding Company have built a 560 foot over all dry dock, with 17 feet of water over the sill. This dock can accommodate the lake steamers; only small repairs, however, are done.

Cleveland now carries on a large export trade by water as well as by rail, and is one of the most prominent shipbuilding cities on the Lakes. The American Shipbuilding Company has a river frontage of 1,600 feet, all of which is occupied by their yards and is devoted to shipbuilding purposes. The dock frontage of Cleveland, on the Cuyahoga River, is 67,000 feet, of which 6,000 feet is city property, and on the lake front the city owns 9,000 feet out of 12,500 feet of dock frontage. Three wooden dry docks of the following dimensions are available to vessels: one, the largest, being 50 feet wide and 500 feet long, the other two being 50 feet wide each and 450 feet and 350 feet, respectively, in length.

Besides the American Shipbuilding Company, there are a large number of repair and machine shops in active operation. The Cleveland City Forge & Iron Company are capable of building large hulls and engines, and have facilities for repairs of great magnitude. Shafting of any diameter can be made by them 60 feet long and up to 100 tons in weight. This firm built the shaft for the Fall River steamer Puritan, which is 31 inches in diameter, 37 feet long and 42 tons in weight. The Globe Iron Works make extensive repairs to engines, hulls and boilers, and make castings up to 12 tons. They have capacity for turning out shafts 6 inches in diameter and 20 feet long, and turn shafts of any diameter up to 18 feet in length.

The geographical position of Buffalo makes it the emporium of trade of the Great Lakes and its distribution to interstate points and to the Atlantic seaboard. Supplies and raw stuffs brought here by water or train are unloaded and shipped by rail or water, most of the traffic of the Northwest passing through Buffalo. It has a large and well-protected harbor on the Lake, with several miles of water front and ample facilities to handle the immense grain, lumber and coal trade which passes through her port. The harbor is amply fitted out with shipbuilding and repair plants and dry docks, the largest firm being the Buffalo Dry Dock Company. This plant is able to turn out new ships of a capacity of 4,000 to 5,000 tons, as well as to make extensive repairs to vessels. The annual capable output is about four large ships. The four dry docks owned by this company are of the following dimensions:

Dock	1.*	2.	3.	4.
Long on top	478′ 0″	358′ 0″	305′ 0″	381′ 0″
Long on blocks	438′ 0″	326′ 0″	270′ 0″	350′ 0″
Wide at entrance	60′ 0″	65′ 0″	56′ 0″	65′ 6″
Wide on top	84′ 0″	43′ 0″	38′ 0″	45′ 0″
Water on sill at mean water level	16′ 0″	14′ 0″	11′ 0″	12′ 6″

*This dock is capable of taking ships 460′ 0″ long over all.

There are numerous other firms which are engaged in building tugs, scows, dredges, canal boats and small pleasure craft. They, however, do not control any dry docks. The Delaney Forge & Iron Company make heavy forgings, and are capable of forging shafts of any diameter up to 25 tons in weight, 45 feet in length.

At Montreal, the harbor is continually being improved, and only recently new docks and basins have been completed. The Canadian government dock is 300 feet over all; those of Cantin's and Tate's have a length of 400 feet. The docks are located in the Lachine Canal, and to reach Dock No. 1, the government dock, the vessel must pass through two 270 foot locks and sail about one half mile up the canal. A third lock of similar dimensions has to be passed before reaching Cantin's dock. The largest ship docked in dock No. 2 was 258 feet in length and 36 feet beam. Machine shops are connected with these docks, so that repairs can be made while the ship is in dock. The Allan Steamship Company have their plant at this point. Large hulls and engines can be repaired at the Caledonian Iron Works and the Laurie Engine Company's plant; the latter make castings up to 30 tons in weight.

J. A. Bensel,
Engineer in Chief Department Docks, New York.

Dockum, dŏk'kŭm, or **Dokkum,** Holland, town in the province of Friesland, on the Ee River. Pop. 4,158.

Doctor, a term meaning teacher, or instructor, applied by the ancient Romans to those who delivered public lectures upon philosophical subjects. In the Middle Ages, from the 12th century, it came into use as a title of honor borne by men of great learning, as by Thomas Aquinas (Doctor Angelicus), Duns Scotus (Doctor Subtilis), Roger Bacon (Doctor Mirabilis), Bonaventura (Doctor Seraphicus), and other distinguished schoolmen. It was first made an academical title at the University of Bologna, in Italy, which received from the emperor the right of appointing *doctores legum* (doctors of laws). The University of Paris followed in 1145. Soon after the Popes granted the universities the right of appointing *doctores canonum et decretalium* (teachers of the canon law); and when the study of the civil law came to be combined with that of the canon law, the title was changed to *doctor utriusque juris* (that is, teacher of both laws). The faculties of theology and medicine followed that of law in conferring this title. In the universities of Germany the title of Doctor of Philosophy (Ph.D.) is that which regularly corresponds to M.A. in Great Britain and in America, the philosophical faculty corresponding to the faculty of arts. The degree of Bachelor is subordinate to that of Master and Doctor. The degree of Doctor is either conferred publicly, with certain ceremonies, or by diploma. In many cases it is merely an honorary degree, in other cases it is conferred after examination or when the person receiving it has presented a sufficient thesis on a subject connected with the branch of study to which the degree distinctively belongs. In Great Britain and the United States the degrees of D.D. (Doctor of Divinity), LL.D. (Doctor of Laws), and M.D. (Doctor of Medicine) have long been conferred, the first two being generally honorary. At some of the universities the degrees of D.Lit. (Doctor of Literature), and D.Sc. (Doctor of Science) have been instituted in comparatively recent times, at some also that of D.Phil. (Doctor of Philosophy). The degree of Doctor of Music is conferred at the universities of Oxford, Cambridge, Dublin, London, and Edinburgh. The degree may be honorary or conferred after examination.

Doctor Angel'icus, or **Angelic Doctor,** a title bestowed, by common consent of the scholastic divines, and ratified by the moderns, upon Saint Thomas Aquinas (see AQUINAS, THOMAS). Similar titles have been conferred upon other eminent mediæval divines and philosophers; as Saint Bernard of Clairvaux was called Doctor Mellifluus (of honeyed speech); Alexander of Hales, Doctor Irrefragabilis (irrefragable); William Occam, Doctor Singularis (peerless); Duns Scotus, Doctor Subtilis (subtle).

Dr. Jekyll and Mr. Hyde, The Strange Case of, a psychologic romance by Robert Louis Stevenson. Dr Jekyll is a London physician of position and good character, who in youth showed strong capacities for evil, which he succeeded in suppressing for years. By experiment he learns the use of a drug which gives his lower nature intermittent embodiment in the form of a misshapen, repulsive creature of violent passions, known as Mr. Hyde. The baser nature triumphs gradually. Hyde commits murder and then suicide, and Jekyll disappears forever. This was the first of Stevenson's books to become widely popular. It was published in 1886.

Dr. Syntax, The Three Tours of, a series of three books by William Combe, written in verse, and depicting the adventures of a certain Dr. Syntax, clergyman and teacher, who, on his horse Grizzle, sets out "in search of the picturesque." The work is marked by mild satire, and describes many well-sketched types of character and class. It was published in 1809.

Doctor of the Church, a name given to certain eminent churchmen. Benedict XIV. gave as the things required to make a man a Doctor of the Church: first, learning so eminent as to fit him to be a doctor in the Church and a doctor of the Church; second, heroic sanctity; third, the title must be conferred by a declaration of the Pope or of a general council. The third has not always been insisted upon. In canon law four Doctors of the Church are named: Jerome, Gregory, Ambrose, Augustine. Others are called doctors without the formal declaration of Pope or council: Chrysostom, Gregory Nazianzen, Anselm, Isidore, Peter Chrysologus, Hilary, Athanasius, and Basil have not the full office proper to doctors. Others who have been added by declaration of popes are: St. Thomas of Aquin, St. Bonaventura, St. Leo, St. Bernard, St. Alphonsus Liguori, and St. Francis de Sales.

Doctor-fish. See SURGEON-FISH.

Doctor's Commons, in England, the popular name for the courts and offices formerly occupied by the body incorporated in 1708 under the title of "The College of Doctors of Law exercent in the Ecclesiastical and Admiralty Courts." The buildings were situated on the east side of St. Paul's churchyard. The college consisted of a president (the dean of the arches for the time being), and of those doctors of law who, having regularly taken that degree in either of the universities of Oxford or Cambridge, and having been admitted advocates in pursuance of the rescript of the archbishop of Canterbury, had been elected Fellows of the college in the manner prescribed by the charter. The term commons refers to the meals, taken together in a common dining-room. Since the passing of laws in 1857 which made many legal reforms possible the charter of this college of doctors has been surrendered, the property sold, and the corporation dissolved.

Doctrinaires, dŏk-tre-nârz', a term applied to theorists, or theoretical politicians. The name had its origin in France in 1815. After the second restoration of the Bourbons a small number of deputies would neither rank themselves among the friends of absolute power nor among the defenders of the revolution. They supported Decazes while he was minister; and several of them held offices in the ministry, as, for instance, the counselors of state, Camille Jordan and Royer-Collard. Their system embraced a constitutional monarchy, allowing the government more power than the ultra-liberals would admit; and, on the other hand, restricting the royal power more, and admitting less ap-

proach toward the old form of government than the ultra-royalists demanded. They retired with Decazes, and afterward joined the liberal opposition. The first orator among them was Royer-Collard, and their most distinguished writer out of the chamber, Guizot. They received the name of *doctrinaires* because they were looked upon more as theoretical than practical politicians.

Dod, Daniel, American mechanic: b. Virginia 28 Sept. 1788; d. New York 9 May 1823. He was educated at Rutgers College. He devoted himself to the study of steam machinery and the construction of steam-engines; the Savannah, the first steamship to cross the Atlantic, had an engine of his construction. He was killed by the explosion of a boiler on a steamboat, the machinery of which he had altered.

Dodd, Anna Bowman Blake, American author: b. Brooklyn, N. Y. She was married to Edward Williams Dodd in 1883. She has been a voluminous writer for the magazines from her youth. Her published books are: 'Cathedral Days'; 'The Republic of the Future'; 'In and Out of Normandy Inns'; 'Glorinda'; 'Falaise'; 'On the Norfolk Broads'; 'The Struthers'; and 'An American Husband in Paris.'

Dodd, Frank Howard, American publisher: b. Bloomfield, N. J., 12 April 1844. He prepared at Bloomfield Academy to enter Yale, but instead went into business in the employ of his father, M. W. Dodd, succeeding to the business with Edward S. Dodd, as the firm of Dodd & Mead, in 1870. He is now the head of the firm of Dodd, Mead & Co.

Dodd, Moses Woodruff, American publisher: b. Bloomfield, N. J., 11 Nov. 1813; d. New York 8 April 1899. He graduated from Princeton in 1837 and entered the theological seminary, but abandoned his theological course on account of failing health. In 1839 he became a partner with John S. Taylor in the publishing business: Taylor retired the next year, and the surviving partner carried on the business for 30 years, under the firm name of M. W. Dodd.

Dodd, William, English clergyman and forger: b. Bourne, Lincolnshire, 29 May 1729; d. London 27 July 1777. He was graduated at Cambridge in 1749 and became chaplain to King George III. in 1763. In 1777 he was arrested on the charge of forging Lord Chesterfield's name, and was hanged in Newgate.

Dod'der, a family of plants, probably degenerate *Convolvulaceæ*, and known as *Cuscutaceæ*. The characteristics of the family are filiform twining stems, parasitic on other plants, to which they attach themselves by suckers. They have lost all trace of leaves, even the cotyledons of the embryo being no longer distinguishable, while chlorophyll is almost completely absent. In one American species a slight trace of coloring matter has been noticed. The seed germinates very late in spring, and as the seedling rises from the ground a yellow or pink stem soon begins to show the sweeping movements of circumnutation of a climbing plant. If no plant known as the "host" is in the neighborhood for it to take up its quarters on, it falls to the ground, but retains its vitality for some weeks, by which time a victim may probably have germinated. As soon as it touches a living plant it twines firmly round it, and a series of small wart-like adventitious roots (*haustoria*) are developed, from the centre of each of which a bundle of suctorial cells force their way through the epidermis and cellular envelope into the bast, and press against the woody tissue of the host. The portion of the dodder stem below this attachment now dies off, and there is then no longer any connection with the ground. The growing point again circumnutates until it finds a new base of attachment upon the same or a different stem of the host, there to repeat the formation of suckers. In this way a tangled skein of threads is formed, over which, late in the season, the flowers, generally pink, develop in dense clusters, and the black seeds are shaken out of the capsule by the wind, or gathered with the crop. This parasite is often very injurious, fields of flax, clover, and lucerne sometimes showing well-marked patches completely desolated by the pest. These have to be mowed down and burned before new seed has set; while pains must be taken to procure seed free from those of the parasite. Preventive measures are, to make careful examination of the seed (see SEED TESTING), rejecting any that contains dodder seed and any produced upon land known to be infested by dodder. Manure of stock fed upon baled hay should always be viewed with suspicion, because the germinating qualities of dodder seeds are not impaired during digestion. When observed growing among a crop, frequent hoeing and burning are often satisfactory. Pasturing with sheep confined to the infested patches is also practised, the animals being kept for several weeks upon the land and given extra food if necessary. The most satisfactory treatment, however, is clean cultivation or the growing of a crop upon which the dodder cannot grow. There are about 100 species of dodder of wide geographic distribution, of which at least 25 are found in the western and southern parts of North America. The temperate species are all annual, but some of the tropical species are perennial. A common American name is tanglewood. It is a remarkable circumstance that *Cassytha*, a totally unrelated Oriental genus of *Lauraceæ*, has not only assumed the same general mode of life, and the twining, leafless habit, but germinates and penetrates in a precisely similar way.

Doddridge, dŏd'rĭj, **Philip,** English Nonconformist clergyman and author: b. London 26 June 1702; d. Lisbon, Portugal, 26 Oct. 1751. He determined to enter the Nonconformist ministry and was educated at a theological academy at Kibworth, Leicestershire. In 1723 Doddridge became pastor of the dissenting congregation at Kibworth. After declining several invitations from congregations whose rigid ideas of orthodoxy he felt would be uncongenial to him, he settled in 1729 at Northampton as minister and president of a theological academy. Here he continued to preach and train young students for the ministry till shortly before his death. Doddridge was at once liberal and evangelical, and with all his religious earnestness and enthusiasm had humanity enough for such levities as cards and tobacco. His principal work is 'The Rise and Progress of Religion in the Soul' (1745), which has been translated into Dutch, German, Danish, French, and even Syriac and

land. Besides this, may be mentioned 'The Family Expositor' (1739–50); his 'Course of Lectures,' delivered to the students under his charge, and published (1763); and a great variety of sermons on miscellaneous religious topics. His hymns, nearly 400 in number, have carried his name over the English-speaking religious world perhaps the best known being 'Hark, the Glad Sound, the Saviour Comes'; and 'O God of Bethel, by Whose Hand.' His 'Correspondence and Diary' appeared 1829–31. See Orton, 'Life of Doddridge (1766); Sanford, 'Life of Doddridge' (1881).

Dodds, Alfred Amedée, French military officer: b. St. Louis, Senegal, 6 Feb. 1842. He was educated at the Lyceum of Carcassonne and at the military school of Saint-Cyr, and entered the French army as sub-lieutenant in 1864. In 1894 he commanded the expedition which resulted in the conquest of Dahomey and the dethronement of King Behanzen. He was appointed commander-in-chief of the French forces in Indo-China in 1896. He became an officer of the Legion of Honor in 1883, commander in 1891, and a grand officer in 1892.

Dodecahedron, dō-dĕk-a-hē'drŏn, a regular solid bounded by 12 equal and regular pentagons, or having 12 equal bases. A solid having 12 faces.

Dodge, Charles Richards, American textile fibre expert: b. Covington County, Miss., 17 July 1847. He was educated at the Sheffield Scientific School of Yale and was assistant entomologist in the United States Department of Agriculture 1867–77, editing 'Field and Forest' 1874–7. Since 1890 he has been in charge of the fibre investigations of that department. He has published 20 special reports on fibres and fibre industries, including a 'Dictionary of the Fibre Plants of the World.'

Dodge, Grenville Mellen, American soldier: b. Danvers, Mass., 12 April 1831. He was educated at Partridge's Military Academy and Norwich University. He served in the Federal army during the Civil War. After the War he was chief engineer of the Union Pacific Railroad and superintended its construction, and was a member of Congress from Iowa in 1867–9. He succeeded Gen. Sherman as president of the Association of the Army of the Tennessee in 1894, and was also president of the New York Commandery of the Loyal Legion. In 1898 he was made chairman of the President's Commission to inquire into the management of the War Department in the war with Spain.

Dodge, Mary Abigail (pseudonym, "Gail Hamilton," American author: b. Hamilton, Mass., 1830; d. there 17 Aug. 1896. For several years she was instructor in the High School at Hartford, Conn. From 1865 to 1867 she was one of the editors of 'Our Young Folks.' Besides numerous contributions to current literature, she wrote: 'Gala Days' (1863); 'Woman's Wrongs' (1868); 'The Battle of the Books' (1870); 'Woman's Worth and Worthlessness' (1871); 'The Insuppressible Book' (1885); 'A New Atmosphere' (1864); 'Red-Letter Days'; 'Country Living and Country Thinking'; 'A Washington Bible Class'; 'Twelve Miles from a Lemon' (1873); 'Biography of James G. Blaine'; 'Our Common School System' (1880).

Dodge, Mary Elizabeth Mapes, American editor, author, and poet: b. New York 1838, d. Tannersville, N. Y., 21 Aug. 1905. From 1873 she edited 'St. Nicholas Magazine' (New York). Her best-known work was 'Hans Brinker, or the Silver Skates' (1876), which went through many editions and was translated into five foreign languages. Among her other works are: 'Irvington Stories' (1864), 'Theophilus, and Others' (1876); 'Donald and Dorothy' (1883); 'The Land of Pluck'; 'Along the Way,' a collection of poems (1879).

Dodge, Richard Irving, American military officer and writer: b. Huntsville, N. C., 19 May 1827; d. Sackett's Harbor, N. Y., 16 June 1895. He was graduated at the United States Military Academy in 1848. He was the author of 'The Black Hills' (1876); 'The Plains of the Great West' (1877), republished in London as 'Hunting Grounds of the Great West'; and 'Our Wild Indians' (1881).

Dodge, Theodore Ayrault, American military officer and writer: b. Pittsfield, Mass., 28 May 1842. He received his military education abroad. Returning to the United States, he enlisted (1861) in the Union service as a private, attaining the rank of colonel, 2 Dec. 1865. He has published: 'The Campaign of Chancellorsville' (1881); a 'Bird's-Eye View of the Civil War' (1883); 'Patroclus and Penelope: a Chat in the Saddle' (1885); and a series of studies called 'Great Captains,' comprising volumes on 'Alexander the Great' (1890), 'Hannibal' (1891), 'Cæsar' (1892), 'Gustavus Adolphus' (1895).

Dodge, Walter Phelps, American author and lawyer: b. of American parents in Syria 1869. He is a nephew of William Walter Phelps (q.v.). Among his works are: 'Three Great Tales'; 'As the Crow Flies'; and 'A Strong Man Armed.'

Dodge, William Earl, American capitalist: b. Hartford, Conn., 4 Sept. 1805; d. New York 9 Feb. 1883. He received a common school education, entered the wholesale drygoods business, and in 1833 became a member of the firm of Phelps, Dodge & Company, retiring in 1879 with a large fortune. He was president of the New York Chamber of Commerce, trustee of Union Theological Seminary, a founder of the Union League of New York, and an ardent friend of the freedman.

Dodge, William Earl, American merchant, son of the preceding: b. New York 15 Feb. 1832; d. Bar Harbor, Me., 9 Aug. 1903. He succeeded his father in the metal firm of Phelps, Dodge & Company, New York, and was long prominent in his native city as a man of business, philanthropist, and art patron. He was the first vice-president of the American Museum of Natural History and chairman of the Executive Committee of the Metropolitan Museum of Art, in which latter position he had been very active. He gave Earl Hall to Columbia University.

Dodge City, Kan., town, county-seat of Ford County; on the Arkansas River, the Atchison, T. & S. F., and the Chicago, R. I. & P. railroads; about 150 miles west of Wichita. When first settled, as a Texas cattle-shipping point, the place was noted for its lawlessness. It is the trading centre of an agricultural and stock-raising region. It is the seat of Soule Col-

lege, which is under the control of the Methodist Episcopal Church. Pop. 2,000.

Dodgeville, Wis., city, county-seat of Iowa County, situated on the Illinois C., and the Chicago & N. W. railroads, about 50 miles southwest of Madison. The industries of the place are chiefly those of an agricultural region, notably creameries. The lead and zinc mines nearby add to the wealth of the city. Pop. (1900) 1,865.

Dodgson, dŏj'sŏn, **Charles Lutwidge** ("Lewis Carroll"), English mathematician and author: b. 1833; d. Guildford 14 Jan. 1898. He took orders in 1861, and till 1881 was a mathematical lecturer. His first publication was 'A Syllabus of Plane Algebraical Geometry' (1860); in the following year he issued the 'Formulæ of Plane Trigonometry,' and in 1864 appeared his 'Guide to the Mathematical Student.' He still remained quite unknown to the public at large, but in the next year became famous as the author of 'Alice's Adventures in Wonderland,' which, though written for the young, has found not less appreciation among those of riper years, and has been translated into many languages. Equally delightful is the continuation of Alice's adventures narrated in 'Through the Looking-glass and what Alice Found There' (1871), an exception to the common rule as to the inferiority of continuations. Both books were admirably illustrated by Tenniel. 'The Hunting of the Snark: an Agony in Eight Fits' (1876), a fantastic narrative in verse, had by no means an equal popularity, however. Among his other works are: 'Elementary Treatise on Determinants' (1867); 'Phantasmagoria and other Poems' (1869); 'Euclid and His Modern Rivals' (1879); 'Rhyme? and Reason?' (1883); 'A Tangled Tale' (1885); 'The Game of Logic' (1887); 'Curiosa Mathematica' (1888 and 1893); 'Sylvie and Bruno' (1889–93); and 'Symbolic Logic' (1896).

Dod'let, a name sometimes applied to the tooth-billed pigeon (q.v.), (*Didunculus strigirostris*), of the Samoan Islands.

Dodo, dō'dō, or **Dronte** (*Didus ineptus*), the name of a very remarkable extinct bird discovered by the Portuguese, about 1507, on the island of Cerne or Mauritius; and afterward seen there by the Dutch, both at the end of the 16th and in the beginning of the 17th century. The last authentic record shows its survival until 1681. As it was never seen after this, it was deemed by some altogether fabulous: but its actual existence was completely established not only by drawings made by artists who accompanied the Dutch voyagers, and preserved in Utrecht, Vienna, and Berlin, but by fragments of the bird itself; among others, a foot in the British Museum, and both a head and a foot in the Ashmolean Museum, at Oxford. Several other fragments, and even entire embalmed birds, reached certain of the continental museums, but seem to have been mostly lost or destroyed. In 1865, and again in 1889, large numbers of bones of the dodo were found in a marsh in Mauritius, from which an almost complete skeleton has been set up in the British Museum, and others distributed to various collections. The dodo had short and ill-shaped legs and feet, scarcely able to support its clumsy and almost globular body, which was about twice as large as that of a turkey; and a monstrous head which, apparently ill-attached to its body, contained an enormous mouth and terminated in a strong hooked beak. Though covered with thick plumes, it was destitute of wings sufficient for flight, and had their place supplied by mere stumps or rudimentary appendages, covered with soft ash-colored feathers, intermixed with yellowish-white; the tail was composed of a few small curled feathers of the same description. Naturalists are now agreed that the dodo should be put in the order *Columbæ* (q.v.) or pigeons, of which it, with one or two similarly extinct birds from neighboring islands, is the representative of an extremely modified family type (*Dididæ*). The cause of the extinction of the dodo, together with several of its associates in the land fauna of Mauritius, is said to have been the hogs which, let loose from the ships of the early explorers, multiplied greatly and overran the island. Consult: Strickland and Melville, 'The Dodo and its Kindred.'

Dodona, dō-dō'nä, a celebrated town in Epirus, in the neighborhood of which was one of the most ancient oracles in Greece. This oracle long maintained its celebrity. It belonged to the Pelasgic Zeus, who was supposed to dwell in the stem of an oak-tree. The prophetic priestesses announced the divine communications in different ways. They approached the sacred tree, and listened to the rustling of its leaves; or, standing by the fountain at the foot of the tree, observed the murmuring of the water which gushed forth from the earth, and in other ways. The sanctuary at Dodona was destroyed by Dorimachus, the Ætolian general, in 219 B.C. See Zeus.

Dods, Marcus, Scottish theologian: b. Belford, Northumberland, 1834. He was educated in Edinburgh, and in 1858 was licensed as a minister of the Free Church of Scotland. In 1866 he was ordained to Renfield Free Church, Glasgow, where he remained till appointed in 1889 to the chair of New Testament exegesis in New College, Edinburgh. Among his published works some of the most important are: 'The Prayer that Teaches to Pray' (1863, 6th edition 1889); 'Epistles to the Seven Churches' (1865); 'Israel's Iron Age' (1874); 'Mohammed, Buddha, and Christ' (1877); 'Handbook on Genesis' (1882); 'Parables of Our Lord' (1883 and 1885); 'How to Become Like Christ' (1897); 'Genesis, John, and First Corinthians in the Expositor's Bible.'

Dods'ley, Robert, English dramatist and bookseller: b. Mansfield, Nottinghamshire, 1703; d. Durham 25 Sept. 1764. He became a footman, and published by subscription a volume of poems, entitled the 'Muse in Livery,' which attracted public favor, less from its intrinsic merit than from the situation of the author. His next effort was the 'Toyshop,' a dramatic satire. Pope patronized this, and through his influence it was brought upon the stage in 1735. Dodsley was enabled, by his profits as an author, to set up a bookseller's shop in Pall Mall, which ultimately proved very prosperous. He next wrote the farce of the 'King and the Miller of Mansfield,' founded on an old ballad, which succeeded so well that he produced a sequel to it, called 'Sir John Cockle at Court.' In 1741 he brought out a musical piece, entitled the 'Blind Beggar of Bethnal Green.' He subsequently wrote:

'Economy of Human Life,' a well-known collection of moral maxims; a tragedy, 'Cleone'; and a selection of tables in prose, with an 'Essay on Fables' prefixed. He planned the 'Preceptor'; the 'Annual Register' (commenced in 1758); the 'Collection of Old Plays,' which now chiefly sustains his fame as a publisher; and the 'Collection of Poems by Different Hands.'

Dodson, John E., American actor: b. England 1857. He studied law, but early in life went on the stage, appearing first in Manchester; he supported Charles Manchester and other star players in England; and in 1889 came to the United States with Mr. and Mrs. Kendal. His first appearance in New York was at the Fifth Avenue Theatre in 'A Scrap of Paper'; later he joined the Empire Theatre Company as leading comedian. He originated the character of Richelieu in 'Under the Red Robe,' and has taken the part of Richelieu in 'Richelieu's Stratagem,' and the part of John Weatherby in 'Because She Loved Him So.'

Dodwell, Henry, English critic and theological writer: b. Dublin 1641; d. 1711. In 1688 he was chosen Camden professor of history at Oxford. After the revolution, his high-church principles inducing him to espouse the cause of the non-jurors, he was deprived of his office. He produced a multitude of works relating to theological and classical literature. Of these the most valuable is entitled 'De Veteribus Græcorum, Romanorumque Cyclis, Dissertationes X., cum Tabulis Necessariis.'

Doe, John, and **Richard Roe,** two fictitious personages in law who formerly appeared in a suit of ejectment. The former was the plaintiff and the latter the defendant. The fiction on which their appearance was based was abolished by the Common Law Procedure Act, and now accordingly they do not appear in England. In American usage, attempts have been made to substitute other names, but in proceedings where the identity of the alleged criminal is not known, or is designedly concealed for any reason, John Doe is the favorite term employed.

Does, doos, Jacob Van Der ("The Elder"), Dutch painter: b. Amsterdam 4 March 1623; d. 17 Nov. 1673. After study with local masters, he lived in France and Italy, painting landscapes of merit, but dark and spiritless in many instances. He had two sons, Jakob and Simon, both painters of note.

Doffer (doff, to put off), a small and slowly revolving cylinder, which strips the cotton or wool from the cards on the main cylinder of a carding machine.

Dog, a mammal of the order *Carnivores*, family *Canidæ*. The origin of the domesticated dog is unknown, but probably it is of composite descent from the jackal, with a certain admixture of wolf indicated, or possibly these have been intermingled with the blood of dog races tamed by men in different parts of the world. When the different tribes and races of men drifted about the earth's surface they took their dogs with them and no doubt breeds were mixed and races exchanged. By naturalists and writers in times gone by, dogs have been divided into groups, but for practical purposes at the present time they are divided into two classes:—sporting dogs and non-sporting dogs. Controversies still rage as to the origin of certain classes of dogs, but almost all hounds that run by scent and the greyhound that runs by sight were of Persian, or at any rate Asiatic origin. The pointer in scientific parlance is the same dog as the hound, and the setter is a large spaniel. The Molossus of the ancient Greeks may be the same as the Thibet mastiff, and progenitor of the Great Dane, boarhounds, mastiffs, and possibly the bulldog.

The main characteristic of the dog is his reliance on man, upon whom he looks as head of the pack. Wild breeds of dogs are the Australian dingo, the Cape hunting dog, the raccoon dog, the Hindoo dhole, and the Venezuelan mountain dog now merged with the Guariquin dog.

In enumerating the breeds we have to deal with at the present day the following comprises the category as met with at the leading dog shows held under the auspices of recognized kennel clubs, or that are used in the ordinary vocations or sports of life:

Non-sporting Dogs	
Mastiff.	Toy Spaniel.
St Bernard.	Japanese Spaniel.
Newfoundland.	Maltese.
Collie.	Pomeranian.
Smooth Collie.	Italian Greyhound.
Bobtail Sheepdog.	Schipperke.
Poodle.	Chow Chow.
Dalmatian.	Chihuahua.
Bulldog.	Bull Terrier.
Pug.	Boston Terrier.
Sporting Dogs	
Bloodhound.	Irish Water Spaniel.
Foxhound.	Clumber Spaniel.
Staghound.	Sussex Spaniel.
Harrier.	Black Field Spaniel.
Beagle.	Norfolk Spaniel.
Otterhound.	Cocker Spaniel.
Deerhound.	Bassetthound.
Greyhound.	Dachshund.
Whippet.	Fox Terrier.
Great Dane.	Scottish Terrier.
Wolfhound.	Skye Terrier.
Borzoi (Russian Wolfhound).	Irish Terrier.
Pointer.	Welsh Terrier.
Setter.	Dandie Dinmont.
Retriever.	Airedale.
	Bedlington.

The interests of the dog and its betterment in breed and those qualities that make the animal valuable are looked after by clubs and associations principally in the United States, England, France, Germany, Austria, Russia, Italy, Australia, and South Africa, in which countries official shows are held at stated times and the rules governing these organizations are recognized so far as breeds are concerned by these governments. A large number of illustrated magazines and journals in all parts of the world are devoted to the interests of the canine race. The principal ones in England are: 'Our Dogs'; 'Stock-keeper'; 'Illustrated Kennel News'; and 'The Field'; in the United States: 'Rider and Driver'; 'Field and Fancy'; 'Dog Fancier'; 'The Kennel'; 'The Sportsman's Review'; 'Stock-keeper'; 'The Field'; and 'The Dog.'

Bloodhound.—In general appearance this noble animal impresses one as the most dignified of any dog. The head is long and clean with tremendous wrinkles and pendulous ears, the eye is small and deeply set, and shows much of the haw. The old fallacy of bloodhounds being ferocious is absurd; they hunt or trail persons by scent and on finding their quarry do



1. Smooth Fox Terrier.
2. Clumber Spaniel.
3. Basset Hound.
4. French Bulldog.
5. English Bulldog.
6. Pomeranian.
7. Pug.
8. Boston Terrier.

not attack, but stand baying until the pursuers arrive.

Standard.— Skull long, narrow, and very much peaked; muzzle deep and square; ears set on very low, thin, and hanging in graceful folds close to the face; deep-set eyes, with triangular lids showing the red haw; flews long, thin, and pendulous, the upper lip overhanging the lower one; neck long, with profuse dewlap; skin of face very loose and wrinkled; coat close; skin thin; shoulders deep and sloping; brisket well let down; loins broad and muscular; powerful thighs and second thighs; good legs; round feet; hocks well bent; tapering stern. Colors: black and tan, red and tan, and tawny.

St. Bernard.— This magnificent dog takes its name from the monastery of Mt. St. Bernard, Switzerland, and is remarkable for its high order of intelligence. It was used by the monks for rescuing travelers lost in the snow. The old type which was small and somewhat plain in head is fast dying out, the present show specimens being more on the mastiff type of head.

Standard.— Head very massive and large, showing great depth from eye to lower jaw; face rather short, muzzle wide, deep, and cut off square; lips hanging down well and rather loose, the stop well defined, but not too abrupt; skull massive and well rounded; eyes dark in color, of medium size, rather deeply set, the lower eyelid drooping slightly, so as to show a little of the red haw; ears rather small, lying well to the cheek, and very slightly feathered in the rough variety; nose black in color, wide, and deep, legs straight, with great bone and muscle; hocks and stifle well bent; feet large and compact; body rather long, broad, straight, and ribs well rounded. The coat of the smooth- or short-coated variety should be very close, thick, and slightly broken-haired. In the rough variety the coat should be dense and flat, of medium length, not woolly, rather long on the neck, thighs, and tail. Color and markings: orange, orange-tawny, and all shades of brindle and red. The markings should be as follows: White muzzle, white blaze on face, shaded with black, black shadings on the ears, white collar round neck, and white on chest, legs, and tip of tail. The body may be white with patches of any of the above colors.

Great Dane.— This dog is a most symmetrical animal, and the embodiment of agility and strength. They were originally used in Denmark and Germany for boar and deer hunting. They make ideal watch dogs.

Standard.— Head, which should be carried high, long and not too broad; muzzle broad, strong, and blunt; eyes small, with sharp expression; neck long and arched, free from dewlap; chest moderately broad; brisket deep; loin slightly arched; shoulders sloping; elbows well under; belly well drawn up; legs straight and muscular; second thighs long and strong; feet large, well arched, and close; coat hard and dense; tail strong at root, and ending fine, carried rather low. Colors: brindle, fawn, harlequin, black, white, and blue.

Mastiff.— In this old breed we have probably the most massive and ferocious looking of dogs.

Standard.— Head large and massive; skull flatly rounded; ears small; muzzle square, deep and broad; teeth level; eyes brown or hazel-colored, and wide apart; front legs straight, with great bone; chest deep; loins strong and large as possible; color, brindle or fawn; in both cases muzzle and ears black; size as large as possible, so long as symmetry is retained.

Newfoundland.— This noble dog is famed for his remarkable fearlessness of water and the readiness with which it will risk its life to save human beings from drowning. The black dog, which is spoken of as the true Newfoundland, is a trifle larger than the Landseer type, which is a black and white dog. Much controversy has taken place as to whence white markings came, some claiming a spaniel cross.

Standard.— Head broad and massive with flat skull and somewhat square muzzle; ears small and lying close to the head; coat straight and dense and capable of resisting water; tail carried gaily, but not curled over; color black, black and white, or bronze; average weight, 100 pounds for dogs and 85 pounds for bitches.

Pointer.— That this breed was descended from the hound was first clearly indicated by Youatt. The disposition to point appears to be due to training, and although other dogs have been taught to point, in no case do they assume the same rigid position so notable in the pointer. This breed is marked by a compact and well knit body, sloping shoulders, muscular limbs, and beautiful action. The head is large and flat, stop well defined with a depression running from the top to occiput, muzzle long and square, with not too much lip. Colors are white with black, liver, and orange markings, and solid black and liver.

Greyhound.— The English greyhound, which is of great antiquity, has been regarded by some as the ancestral stock of the majority of our domestic dogs, but this is doubtful. It is easily distinguished at a glance from all other dogs by its graceful outline and large size. Greyhounds hunt entirely by sight instead of scent.

Standard.— Head long and lean, rather wide between the eyes and flat at the top; jaw powerful, but cleanly cut; teeth level and white; eyes bright; ears small and fine in texture and rose-shaped; neck long and muscular, elegantly arched, and free from throatiness; shoulders oblique and muscular; chest deep and capacious; back broad and square, rather long and slightly arched over loins which should be strong and powerful; forelegs rather long and set under dog, possessing fair amount of bone; hind quarters strong and broad across, stifles well bent, thighs broad and muscular, hocks well let down; feet round, well split up with strong soles; tail long, tapering, and nicely carried; coat fine and close; color, black, red, white, brindle, fawn, blue, and the various mixtures of each.

Whippet.— This breed is the result of a cross between a greyhound and a terrier, and is bred especially for rabbit coursing and racing. In the latter sport these dogs are without doubt the most speedy animals known, even exceeding the speed of the racehorse for a short distance. In outline they are identically the same as the greyhound.

Staghound.— It is a large hound, white in color with black and tan markings; the head somewhat on the pointer type, but the ears more pendulous and set lower. This breed has been used for many years in Europe for stag hunting.

Deerhound.— The Scotch deerhound is larger and more massive than the English greyhound, frequently standing as high as 28 to 30

inches at the shoulder, the body being clothed with a rough coat. Its principal use is for deer-stalking in the Highlands.

Standard.— Head long and narrow, tapering gradually from the ears; nose black (occasionally blue) and pointed; lips level; ears small, set high, carried in a fold, soft and silky, and free from long hair; neck long, but strong, with the nape or crest very prominent; shoulders sloping; toes close and arched; chest deep; body long, but well ribbed up; loins arched with great breadth across hips; stifle well rounded; thighs long; tail set on low, curved but not curled; coat rough and harsh on body; mane on neck and slight fringe on inside legs, on thighs and on tail. Colors: All shades from dark blue or black brindle to light gray brindle, yellow, fawn, dun, and drab; white markings objectionable, but very often to be found on chest and toes.

Irish Wolfhound.— This ancient breed was famous for many years in Ireland for its great power and strength and its prowess against wolves. It has practically the same lines as the deerhound only more massive in skull and body. The colors are the same.

Borzoi or Russian Wolfhound.— Is of rather larger build than his English cousin, being covered with a wavy silky coat quite different in texture from that of the deerhound and wolfhound; the head is more domed and muzzle of the Roman nose type. It is used in Russia for hunting wolves. Colors are white with drab, fawn, or brindle markings.

Italian Greyhound.— This breed is kept purely as pets and may be regarded as a miniature greyhound. The eyes are much larger and more prominent than in the large greyhound. There are several colors, among which are a golden fawn and a mouse fawn, the most valuable colors; white markings are undesirable.

English Foxhound.—The modern foxhound is somewhat smaller than the staghound and cobbier in body; the head is cleaner with more substance in the muzzle; the ears are rounded and placed much higher on the skull. The American foxhound is much the same type, but somewhat smaller and lighter built, the colors often being black and tan, showing a bloodhound cross.

Beagle.— This term is generally applied to any hound standing less than 15 inches high, although the true pure breed beagle is a distinct breed, which may be regarded as a miniature foxhound with the exception of the ears, which are more pendulous; the height varies from 9 to 15 inches. The beagle has a musical note and an acute scent as well as great perseverance in following a trail.

Setters.— The various breeds known as setters are practically large spaniels which acquired this name from being taught to crouch when marking their game.

English Setter.— It is regarded as a result of a cross between the field spaniel and the pointer, and should have a soft coat with a slight wave, but no curl in the hair. There is a great variation in color, which is valued according to the following scale: black and white ticked with large splashes, or the Blue Belton; then orange and white freckled, known as the "Orange Belton"; black and white with tan markings; and black and white.

Standard.— Head long and lean with a flat skull; muzzle long and deep; lips not too pendulous; ears of moderate size, fine in texture, set on bone, and well back; neck long, muscular, and well set in sloping, deep shoulders; chest narrow, but deep, and ribs well sprung; loins muscular and slightly arched, with powerful hind quarters; front legs perfectly straight, and feet small and firm; toes arched and close together.

Irish Setter.— Of a deep-red mahogany color, this dog is rather lighter in build than the English setter, with a narrow and slightly domed head.

The Gordon or black and tan setter is much heavier than either the English or Irish breeds, this heaviness being especially shown in the head, which is broader and deeper. The body should be massive and black with tan markings.

Retriever.— This name applies to a large dog somewhat on the order of the setter, employed for retrieving game. They have more or less Newfoundland blood in them and trace their parentage to the water spaniel or setter. The curly-coated retriever, which may be either black or liver color, is the product of a cross between the smaller black Newfoundland and the Irish water spaniel. It is characterized by the short hair of the face and the tail devoid of any fringe, although covered to within a few inches of its extremity with short, crispy curls. The hair on the body is closely and crisply curled, hence the old phrase of the "nigger-coated retriever," a term used in some counties in England. The wavy or flat-coated retriever has the same outline, with the exception of the coat, which is flat and wavy, and is close to the body.

Chesapeake Bay Dog.— As the name signifies, this dog is a native of Chesapeake Bay. It resembles a dull-colored red retriever both in color, shape, and size. The coat is extremely dense and absolutely waterproof. For general retrieving work in the water we know of no dog which can equal it. It has been known to work the whole day in the ice and never seems to tire.

Sporting Spaniel.— The Clumber spaniel derives its name from Clumber Park, the estate of the Duke of Newcastle, where this breed has been kept for many generations. The Clumber is distinguished by its silence when hunting, and is a large, low, heavy, massive dog, with immense bone.

Standard.— Large, low, heavy, and massive throughout, with immense bone; head large, with largely developed forehead; brows heavy and eyes deeply set; muzzle long and very square, with a fair quantity of lip; ears small when compared with the size of the dog, and well shaped, hanging close to the face. Color is white with lemon markings.

Field or Black Spaniel.— It is somewhat on the Clumber style, but has much more activity, a longer muzzle and cleaner head.

Standard.— Head long and lean, with a good length of muzzle, which must not be snippy; a short, coarse, or clumpy head is objectionable; eyes dark; ears very low down, narrow where they leave the head, long and lobe-shaped; body large, deep, long, and low; tail carried below the level of the back; legs straight, strong, short, and very large in bone. Although a long, low dog, he must be active, with plenty of life, and any resemblance in shape, action, or movement to the bassetthound or dachshund should be discarded.



1. English Setter.
2. Greyhound.
3. Irish Terrier.
4. Great Dane.
5. Poodle.
6. Bull Terrier.
7. Russian Wolfhound.
8. Collie.

Cocker Spaniel.— The weight of this variety of spaniel at exhibitions is usually under 26 pounds. The head is long and narrow, but not quite so lean or long as the field spaniel, the muzzle well developed and not snippy; eyes dark, and although not full or prominent, a little larger in comparison with the size of the dog than the eye of the field spaniel; ears long, and small near the head, set low, and lobe-shaped; body large, deep, and round throughout, and in length much shorter than in the field spaniel; stern set low; legs powerful and straight, and a little longer than the field spaniel; and coat flat and abundant, but not too long; and with plenty of feather. It should be remembered that, although a small spaniel, the cocker is a sportsman's dog, and any trace in shape, make, expression, or action of the toy spaniel should be discarded.

Irish Water Spaniel.— This quaint animal is possibly the most useful all-around worker of the whole group of spaniels. The general appearance is that of a big upstanding shaggy liver-colored dog with a strong head and a distinct top-knot, a well furnished cobby body, and a rat-like tail. These dogs are especially fond of the water and good on all retrieving work.

Dalmatian.— The Dalmatian or coach dog is probably allied to the pointer. It is distinguished by the spots which are black or liver, on a white ground. Its use in England and America is essentially as a carriage dog, and it devotes itself entirely to the horse, often sleeping in the same stall. In its native country the Dalmatian is used as a pointer and is said to be staunch on game.

Standard.— Head longish, skull flat, moderate amount of stop; muzzle long and powerful; eyes medium size, and dark or light according to markings; neck fairly long and arched, no throatiness; chest very deep, not wide under; feet compact, well padded; tail smooth, slightly curved upward; coat short, hard, dense; ground color pure white; spots pure black or liver color; very decided, not intermixed; ears and tail well spotted; weight 50 pounds. The general appearance is that of a pointer.

Sheep Dog.— The Collie is essentially of Scotch origin. In appearance it is one of the most handsome of the canine race, having a well-knit frame, chest deep, but not wide; fore legs straight, hocks well bent, feet compact and strong. The head should be long, fairly narrow, and flat; ears small, set well back on the head, and carried semi-erect, but not pricked. Colors are black and tan, black, tan and white, sable, and sable and white.

Smooth Collie.— Is practically on the same lines as the rough collie, with the exception of the coat, which is smooth and lies very close, and the eyes, which, in many cases, are china or wall-eyed, that is of a whitish color.

Old English (Bobtail) Sheep Dog.— This quaint old breed is quite different in type from the other sheep dog, having a short, wide skull and very massive body, which is covered with a rough, shaggy coat, with an abrupt, or bob-tail, hence the name. Is much used in England by the drovers and is locally known as the drover's dog.

Standard.— Color, any shade of blue, blue merle or grizzle, with white on face or legs for relief; head big and square; eyes small and dark; in very light-colored dogs wall or marble; square in body and as large as possible, with a broken, harsh, wavy coat; ears small and neatly set on side of head.

Bearded Collie.— Is practically a repetition of the bob-tail, with the exception of the tail, which is long and carried low, and the body, which is not quite so short or massive.

Bull-Dog.— This breed is, without doubt, the most maligned of the canine race. In appearance it is that of a low cobby dog, with a very large flat skull, showing much wrinkle, short nose or face and a long, wide turned-up underjaw. In body is low and wide in front, with well sprung ribs and a short roach or wheel back, and a short, tapering tail, which must not be carried above the level of the back. Since the old-time sport of bull-baiting has been done away with the bull-dog has been bred especially as a pet. They are, in no way, fighters, being, without doubt, the most affectionate of all breeds.

Standard.— Thick-set and compact; very heavy in front, and of comparatively lighter build behind; legs short, muscular, and set outside the body, but not exaggerated; shoulders massive, and standing well out; chest wide and deep; skull large; and temples high, with stop well defined; eyes wide apart, and dark in color; underjaw wide, and well turned up; nose large, black, and very short; strong loin, well tucked up; tail short and set on low; colors, all shades of brindle, fawn, white, and all pied colors.

Terrier.— The bull terrier, as its name implies, is a cross between the bulldog and the white English terrier. The general appearance is that of a symmetrical animal, the embodiment of agility, strength, and determination. The ears are cropped, which gives a smart and alert appearance. The popular color is pure white with small black eyes and nose; a cherry or flesh-colored nose is undesirable.

Standard.— Head long, flat, and wide between ears, tapering to nose without cheek muscles, slight indention down face, without a stop; jaws long and very powerful; large black nose, and open nostrils; eyes small and very black; lips meeting as tightly as possible without a fold; teeth regular in shape and meeting exactly, a deviation being a great fault; ears always cropped; neck long, slightly arched, nicely set in shoulders, tapering to head, without any loose skin; shoulders strong, muscular, and slanting; chest wide and deep; ribs well rounded; back, short and muscular; fore legs perfectly straight, with well developed muscles, not "out at shoulder," and very strong in pasterns; hind legs long, muscular, and good strong, straight hocks, well let down; feet like those of a cat; color white; coat short, but close, stiff to the touch, and with fine gloss; tail set on very low, and 10 to 12 inches long, thick where it joins the body, tapering to a fine point, carried without a curl and never over the back.

Airedale Terrier.— This is a large, rough-coated terrier, found chiefly in Yorkshire, England. It derives its name from the river Aire, where it is much used for all hunting purposes. The general appearance is that of a big, rough-coated dog, on the same lines as the Irish terrier, but much stronger and heavier built. The colors are black and tan, and grizzle and tan, and the weight from 40 to 55 pounds. The coat should be short, very dense, and of a harsh texture.

Scottish Terrier.— The general appearance is that of a low cobby rough coated terrier with prick ears. The head should be long and narrow, with small, dark eyes and a long punishing jaw; the front legs straight, and shoulders strong, but not too broad; body short and the tail carried gayly; weight from 14 to 20 pounds; colors, wheaten, red and black brindle, and solid black. White markings are objectionable.

Skye Terrier.— This is, undoubtedly, the old Highland terrier, a long, low dog, with a long, straight coat of dark steel blue, or gray color; head broad and strong, with a long jaw; nose pointed, and eyes small, dark, and set close together; body long and low, but arched at the loins, and tail carried low, and ears pricked or drop, the latter carried low and close to the head.

Dandie Dinmont Terrier.— This game little terrier is also of Northern origin. It is low on the leg and strongly built. The head is apparently large in proportion to size; skull fairly wide and covered with a top-knot of silky, light hair. Colors are pepper or mustard; tail carried gayly above; weight not over 25 pounds.

Bedlington Terrier.— This breed hails from the northeastern counties of England. It is rather long and wiry in appearance, with a bluish, or sand-colored coat. The head is long and narrow, with a silky top-knot, somewhat like the Dandie, but is much narrower in skull. These dogs are exceedingly game and weigh 12 to 18 pounds.

Welsh Terrier.— As the name implies, these little dogs come from Wales. They are, in general appearance, much like the Airedale and of the same color; the head is broader in comparison and eyes set wider apart. The weight should not exceed 20 pounds.

Yorkshire Terrier.— This is a small breed, bred chiefly in the county of Yorkshire, and is easily distinguished by its very long, silky coat, especially on the face, which is parted from the nose down the whole length of the body to the tail. It is exceedingly bright and quite game, but valued chiefly as a pet. The colors are a dark blue body, with tan markings; and black with tan markings. The ears are cropped and carried erect, and the weight is between three and eight pounds.

Maltese Terrier.— This dog is on the same lines as the Yorkshire, but a trifle larger, colored pure white, with a black nose and small, deep-set eyes. The coat should be flat and not curly, which, in many cases, shows a toy poodle cross.

Manchester or Black and Tan Terrier.— A smooth-coated terrier which has been bred for many years in Manchester, England, derives its name thence. The general appearance is that of a smart dog with a black body and rich tan markings on the legs and feet; the division between the colors should be well defined. The ears are cropped or V-shaped. The weight is from 7 to 20 pounds. The toy black and tan is identically the same breed, but does not exceed seven pounds in weight.

Dachshund.— This quaint and very game breed is essentially of German origin. The general appearance is that of a dwarfy short-legged, long-bodied, but sturdy dog, with strongly developed muscles. The head is long and fairly broad, conical in shape, tapering toward the nose, with ears set high and broad and nicely rounded, not pointed or folded. The legs should be short and muscular, but not over at the knees; elbows well under, and shoulders broad and well placed; loin short, firm, and broad; and tail short, but carried gayly. Colors are solid red, black and tan, and dappled. The coat should be smooth and glossy. The rough coated variety, which is now becoming popular, is on the same lines exactly.

Poodle.— This is probably the cleverest of all dogs and most apt to learn tricks. Its colors are a deep black, blue, red, white, or cream. There are two varieties, the corded, which has a long, rope-like coat, and the curly, which should be short and tightly curled like astrakhan. They make ideal companions and can readily be broken to the gun and make grand retrievers.

Fox Terrier.— The fox terrier is probably the most popular of all terriers. It is said to have descended from a cross between the small fox hound and the English terrier. It derives its name from the use of driving foxes from holes or burrows in the ground. The most popular color is a pure white body with black and tan markings on the head, with an even blaize up the face. The head should be flat and narrow, with a strong foreface or muzzle, eyes small, ears likewise small and of V shape, carried forward and close to the head. The body should be short, with well-sprung ribs, narrow in chest, with clean sloping shoulders, perfectly straight front and cat-like feet. The wire-haired dog is identically the same as his smooth brother, with the exception of the coat, which should be rough, with a decided harsh texture. Weight, 15 to 21 pounds.

Irish Terrier.—As the name implies, is of Irish origin and is aptly named the "Dare Devil," being very game. In size it is somewhat larger than the fox terrier, and more racy in body, and has larger feet. Cropping the ears has now gone out of fashion, the modern ear being the same as the fox terrier.

Standard.— Head long, rather narrow, punishing jaw, eyes small and dark, ears fairly small, not set on too high, legs straight and strong, feet round and thick, with good pads; chest narrow, with good depth of brisket, back strong and straight. Color, wheaten and red. Expression wicked but intelligent. Coat short and rough, and very harsh.

Boston Terrier.— This smart little dog is especially of American origin having been raised in Boston and the nearby towns for the past 40 years. It resembles the bull-dog in head, but is void of wrinkle and must not show the teeth; the body should be built on the terrier type, having a narrow front, with strong, but not wide, shoulders, short back, and a short screw or tapering tail. The ears are cropped and carried erect. The three classes by weight are under 15 pounds, under 23 pounds, and not exceeding 32 pounds. Colors are brindle with white markings, fawn and white, or red and white. They are used entirely as pets.

Pugs.— This quaint breed is one of the most popular house pets. In appearance they resemble the bull-dog, having a short, square muzzle and heavily wrinkled head. The ears should hang close to the head and be carried forward; the body be short and round and the tail curled and lie on the back. The colors are a rich apricot fawn with black shadings and a deep black.

Toy Spaniel.— The English toy spaniels are the King Charles, or black and tan, the Blenheim or orange and white, the Prince Charles, and the Red, and are practically all of the same family, distinguished only by the colors. The head should be large and domed, with the ears set very low in the skull; the nose, or face, as short as possible and stop well defined; eyes as large as possible and very prominent; body short and well coated, and small in size. They are essentially house pets.

Japanese Spaniel.— It is black and white, or orange and white. The head is not so large or domed as the English spaniel and the ears are much smaller and carried higher and V-shaped; eyes wide apart and showing a good deal of the white; tail heavily coated and carried over the back. In size it is as small as possible.

Charles G. Hopton,
Kennel Editor of 'Rider and Driver.'

Dog-days (Lat. *caniculæ*), the name applied by the ancients to a period of about 40 days, the hottest season of the year, at the time of the heliacal rising of Sirius, the dog-star; that is, the time when it rose just before the sun. The heat, which is usually most oppressive at this season, was formerly ascribed to the conjunction of this star with the sun. We still retain the expression dog-days, as applied to the hottest season of the year, but owing to the precession of the equinoxes it is no longer the time of the heliacal rising of the dog-star.

Dog-fish, the popular name of several species of small shark (q.v.), chiefly belonging to *Mustelus* and *Squalus*, two quite unlike genera. The name is derived from their habit of swimming in schools or packs in pursuit of their food. In their general anatomy, they differ but little from the other sharks, so well known for their ferocious and savage habits. The dog-fishes, though among the smallest of the tribe, manifest propensities equally cruel with those which have rendered the white shark and others so justly dreaded. Although seldom or never injurious to man, they commit great ravages in the fisheries, and where they abound constitute one of the greatest nuisances to the fishermen. Exceedingly voracious and devouring almost everything which they encounter, the mischief they occasion by taking the baits, and very often the hooks, of the deep-sea lines, is very considerable and not at all compensated for by the flesh of those which are captured.

The smooth dog-fish or dog-shark (*M. canis-nus*) is found on both sides of the North Atlantic, and on the American side is particularly abundant south of Cape Cod. It is about 2 to 3 feet long. No spines occur in the margins of the dorsal fins, and the smooth pavement-like teeth are especially adapted for crushing crabs, lobsters, and other testaceous invertebrates on which they chiefly feed. The young are hatched from the egg in the oviducts of the female (with which, however, they are not connected by a placenta, as in the related *Galeus mustelus* of Europe), and are born alive. The eggs are similar to others of the family, and covered by a tough membranaceous integument. The skin of these fish is beset with numerous small asperities, which render it, when dried, well adapted for polishing wood and for other mechanical purposes.

The spiny dog-fish (*Squalus acanthias*) is very abundant on the coasts of New England, and, although similar in size and general aspect, is readily distinguished from the smooth dog-fish by the presence of a strong spine before each of the two dorsal fins. The eggs are deposited before hatching. This species furnishes material for a valuable fishery and fish industry in Maine, where the oil is extracted from the livers, the flesh ground up for fertilizers or poultry food, and the skin utilized for polishing metal and wood. The dog-fish feeds chiefly on herring and mackerel, the schools of which it follows in immense numbers. Similar species occur in the Pacific Ocean and other seas.

The flesh of all the species is hard, dry, and unpalatable, requiring to be well soaked before it is eaten. In England the dried flesh goes under the name of Folkestone beef. Poisonous effects are at certain times observed in consequence of eating the livers of dog-fish, and some cases are recorded in which the most distressing illness has been occasioned by the practice. The name dog-fish is also applied to several other quite distinct fishes, more particularly to the western mud-fish or bow-fin (*Amia calva*), and to the dog-salmon (*Oncorhynchus keta*).

Dog-grass. See Couch-grass.

Dog Parsley, one of the common names of *Æthusa cynopium*, a poisonous plant of the carrot family, the only species of the genus *Æthusa*, found in America, from Nova Scotia west to Minnesota, and south to New Jersey, having been naturalized from Europe. The fruit bears some resemblance to the fruit of dill and fennel, and is sometimes eaten in mistake for these. The sharp acrid taste marks the difference. Other names are: Fool's parsley, fool's cicely, and dog-poison.

Dog Rose (*Rosa canina*), a plant of the rose family (*Rosaceæ*); known also as the canker rose, wild brier, and referred to by Shakespeare as "canker-blooms." It is a native of Europe and northern Asia. The ripe fruit is sometimes used abroad to make a preserve that is employed in the manufacture of pills. The plant is naturalized in America, and is found along roadsides from Nova Scotia through western New Jersey and eastern Pennsylvania, and particularly abundant in the valley of the Delaware; it is also found in Tennessee.

Dog-salmon, a name given in Alaska to the *Oncorhynchus Gorbuscha*, more commonly known as the hump-backed salmon. This is a species of the widely extended Pacific salmon, which are found on the North American coasts from Alaska to as far south as Oregon or even the Sacramento River.

Dog-star (Sirius), the star that gives their name to the dog-days (q.v.). Sirius is the brightest star in the heavens, and once was thought to exercise a baleful influence upon human affairs. It is now a clear white star in the constellation Canis, though Seneca and Ptolemy describe it as red.

Dog-tooth Spar, a common variety of the mineral calcite (q.v.), so named because of the resemblance of the acute scalenohedrons, of which it is composed, to a dog's tooth.

Dog-tooth Violet, a common but erroneous name for plants of the genus *Erythronium* (q.v.).

Dogbane, the English name of the *Apocynaceæ*, a natural order of perennial herbs, shrubs, vines and, in some tropical genera, trees, nearly all possessing a milky acrid juice. The order includes about 130 genera, and 1,050 species are recognized. They are widely distributed throughout the world, the larger number in the tropical regions. In America at least 4 genera, and 10 or more species are known. The typical genus *apocynum* is represented by the largest number, of which three are called dogbanes, the best known being *A. cannabinum*, Indian hemp (q.v.). The spreading dogbane or honey-bloom (*A. androsæmifolium*), known also as bitter-root, is found in fields and thickets from Anticosti and British Columbia to Georgia, Nebraska, and Arizona. It belongs to the natural order *Apocynaceæ*, many of the plants of which are poisonous, and some of them drastic purgatives. The whole plant yields the acrid milky juice so common in members of the family; the root is intensely bitter and nauseous. It is the most powerful part, and is employed by country physicians instead of ipecacuanha.

Dogberry. See DOG-WOOD.

Doge, dōj (from the Latin *dux*, a leader or duke), formerly the title of the first magistrates in the Italian republics of Venice and Genoa. The first doge of Venice elected for life was Paolo Anafesto, in 697. The doge was first elected by the people, but afterward by the great council. He held his dignity for life. His power was at first almost absolute. He could convoke legislative assemblies, declare war, conclude treaties, take command of the army, appoint military officers and judges, invest bishops, and award ecclesiastical penalties. But this absolute authority became by degrees very limited. The dignity was abolished with the overthrow of the republic in 1797. In rank he was considered only equal to a duke, though the republic of Venice was in dignity equal to a kingdom. In Genoa the office of doge was established in 1339. Here also the doge was at first elected by the people, but the dignity afterward experienced numerous changes both in this and other respects. After the liberation of Genoa from the yoke of France by Andrea Doria the power belonging to this office was more systematically defined. A great and small council were created, and the duration of the office was limited to two years. After the overthrow of Genoa by the French in 1797 the dignity became extinct, although it was revived for a short time between 1802 and 1805. See GENOA; VENICE.

Doge's Palace, The (It. *Palazzo Ducale*), the official residence of the former rulers of Venice, begun in 1350 and finished in 1442. Its variegated walls of marble and its colonnades make it one of the most striking sights of the city. It is famous for its carvings and paintings. The halls of the interior are adorned with works by Titian, Tintoret, Veronese, and other Venetian masters.

Dogger, dōg'gėr (from Dutch "dogger," a codfish), a Dutch vessel equipped with two masts, and somewhat resembling a ketch. It is principally used for fishing in the North Sea, chiefly on the Doggerbank.

Doggerbank, an extensive sand-bank of the North Sea, between England and Denmark. It is celebrated for its cod fishery.

Doggett's Coat and Badge, a prize for a rowing-match on the Thames, which takes place every year on 1 August, the course extending from London Bridge to Cadogan Pier, Chelsea. The first prize is an orange-colored waterman's coat and a silver badge representing the white horse of Hanover, and to this have been added other prizes, the first prize being also augmented. The match is open to six young watermen recently out of their apprenticeship. It was instituted by Thomas Doggett, a native of Dublin, and a popular actor in the early part of the 18th century, who left a bequest for the purpose of founding the prize in commemoration of the accession of George I. (1 Aug. 1715). Dibdin's ballad opera, 'The Waterman,' is based upon this rowing contest.

Dogma, in the theological sense of the word, is a tenet of faith given in the word of God whether written or traditional and proposed by the Church to the belief of the faithful. Primarily the term dogma, being derived from the Greek verb δοκεω, to seem, to appear, meant only opinion; but in the ancient schools of philosophy dogmata (plural) were the doctrines of the several heads of such schools. The disciples of Pythagoras accepted on the authority of The Master, as they styled him emphatically, the tenets he proposed, the sufficient ground of the disciples' belief being that αὐτος ἐφη "He said it." Perhaps the first employment of dogma, dogmata in the now current meaning of the word, is found in a work by St. Ignatius, disciple of St. John the Evangelist, who in an epistle to the Magnesians exhorts them to be "established in the dogmata of the Lord and the apostles." The dogmas of the Roman Catholic Church purport to have been taught by the apostles and to have been by them handed down τῇ τοῦτε or in writing, to their contemporaries and successors, who in turn did and still do the like: that tradition is the foundation of all the Church's articles of belief. The Church has no power to frame new dogmas, and she must to the end of time proclaim the self same dogmas which at any time in her history were authentically set forth as truths of divine revelation. What the Church may do and has done is to define, as occasion may require, the precise meaning of her teachings, bringing out into definite shape what before was not expressed with all necessary fulness or clearness. An example of this is had in the application of the term transubstantiation to signify what the Catholic Church had at all times believed and taught — that the bread and wine are, in the sacrament of the Eucharist, really and substantially changed into Christ's body and blood.

Dogmatics, a systematic arrangement of the articles of Christian faith (dogmas), or the branch of theology that deals with them. The first attempt to furnish a complete and coherent system of Christian dogmas was made by Origen in the 3rd century, who was followed by St. Augustine in the 4th century. Among Protestants, Melanchthon was the first who wrote a compendium of the Christian doctrine.

Dog's-fennel, a plant (*Anthemis cotula*) belonging to the natural order *Compositæ*, and *camomile* genus. It is found in fields and waste places throughout North America, except in the Arctic regions, having been naturalized from Europe. It is known as a weed in Asia, Africa,

and Australia. It deriyes its name of dog's-fennel from the resemblance of its leaf to fennel, and from its bad smell. It has an acrid taste and emetic properties. This plant is also called "stinking May-weed," the scentless May-weed, or wild camomile (*Matricaria inodora*). The name dog's-fennel is sometimes applied in America to a species of the genus *Eupatorium*, hog-weed.

Dogs, Isle of, a peninsula of London extending into the Thames opposite Greenwich. The Millwall docks are on this peninsula. The king's hounds were formerly kept here, hence the name.

Dog's-tail Grass, so called from the resemblance of the spike to a dog's tail. (Lat. *Cynosurus*), a genus of four or five annual and perennial grasses, with flat leaves, native to the north temperate regions of the Old World. One of these grasses has been introduced into this country and is sparingly established. Crested dog's-tail (*Cynosurus cristatus*) is a slender, erect perennial growing from one to two and a half feet high, with narrow leaves and a rather slender, erect, spike-like panicle. It is valuable for lawns, constituting a large proportion of the sward of some of the best bowling greens of England. Its close, compact sod makes it an excellent pasture grass, especially for sheep. Its nutritive value is high, but its yield is low, and its tendency to seed itself in districts where it will grow, to the exclusion of more profitable grasses, and the objection of animals to its wiry flower-stalks, together with the high price of seed, will no doubt restrict its usage by American farmers. It will grow on thin soils, in a humid climate, but prefers a rich moist soil. It grows well in the shade and flowers from June to August. The seeds are small, shining and yellow, and impurities are readily recognized. The mature flower-stalks are valuable, being used in the manufacture of Leghorn hats.

Dog's Tongue, a biennial plant, *Cynoglossum officinale*, belonging to the *Bornaginaceæ*, Borage family. It grows on waste ground and pastures.

Dogtooth, in architecture, an ornamented molding used in early mediæval times in the form of a four-leaved flower, with teeth projecting in the centre; also a steel punch used in working marble.

Dogwatch, on shipboard, a name given to each of two watches of two hours each instead of four, adopted for the purpose of varying the hours of watches kept by each part of the crew during the 24 hours. The watches are arranged thus: 8 to 12 P.M.; 12 to 4 A.M.; 4 to 8 A.M.; 8 to 12 A.M.; 12 to 4 P.M.; 4 to 6 P.M., dogwatch; 6 to 8 P.M., dogwatch; 8 to 12 P.M., and so on.

Dogwood, the common name of the *Cornaceæ*, a natural order of plants, either shrubs or trees, with three or more entire leaves at a node, and polygamous or diœcious flowers in cymes, but sometimes solitary. The fruit is a drupe. The family numbers about 16 genera, and 85 species, most numerous in the northern hemisphere. Of the genera, two are found in America. *Cornus*, the typical genus of the order, has 25 species natives of the northern temperate zone, Mexico, and parts of Peru, 18 of which are found in America. To this genus belong the American shrubs and trees, known as cornel (q.v.), dogwood and kinnikinnik. The other American genus is nyssa (q.v.), which includes the trees called pepperidge, sour-gum, and tupelo. The wood of *C. florida* is smooth, white and fine-grained, and is used for inlaying, and from the bark a febrifuge is made. The southerners who "dip" snuff, use the small branches of the tree to make the brush with which the snuff is applied. The common dogwood of Europe (*C. sanguinea*) is a shrub of remarkable beauty in autumn owing to the deep redness of its foliage. The wood makes the very best charcoal for gunpowder. It is very hard, and is made into skewers, cogs for wheels, etc., and in former times it was in request for making arrows. The small bitter fruit yields as much as one third of its weight of an oil resembling that of olive. The wood of *Rhamnus frangula*, the berry-bearing alder, is also used by gunpowder-makers, and called by them dogwood. Jamaica dogwood (*Piscidia erythrina*) is a papilionaceous timber-tree; the cortex of the root is powerfully narcotic, used for stupefying fish or deadening the pain of toothache.

Dohnanyi, dō-nŏn'yē, **Ernst von,** Hungarian composer: b. Presburg 1877. While a pupil at the Royal Conservatory at Budapest 1894–7 he took several prizes for composition. In 1897 he studied with D'Albert to perfect himself in the technique of the pianoforte previous to touring the chief cities of Austria, Germany, and England. His tours of America in 1900 were successful. His pianoforte concerto in C minor took the Rosendorf prize, Vienna, March 1899. This he played with the Boston Symphony Orchestra.

Dohrn, dōrn, **Anton,** German zoologist: b. Stettin 29 Dec. 1840. He studied at Königsberg, Bonn, Jena, and Berlin, lectured for a time on zoology at Jena, and in 1870 he founded the great zoological station at Naples. As an embryologist he has devoted himself mainly to the development of insects and crustaceans; and besides reports, he has published works on the origin of the vertebrates.

Doit, a small copper coin anciently current in Scotland, and equal in value to one twelfth (according to others, one eighth) of a penny sterling. There was also in lower Germany a small coin called *deut*. In the Netherlands the coin is called *duyt*.

Dolabella, dŏl-ą-bĕl'ą, **Pub'lius Cornel'ius,** Roman leader: b. about 70 B.C.; d. 43 B.C. He married Cicero's daughter Tullia, but treated her so harshly that she was ultimately obliged to leave him. He possessed considerable talents, and at one time stood high in the opinion of Cicero, though there is reason to suppose that Cicero valued him chiefly for the assistance he expected him to give against Cæsar and his party. When disappointed in this expectation his eyes were opened, and he spoke of him with the utmost bitterness and contempt. Dolabella, when about to fall into the hands of his enemies, was slain at his own request by one of his soldiers.

Dolabra, dō-lā'brą, the Latin name for a Celt. See CELTS.

Dolbear, Amos Emerson, American educator and inventor: b. Norwich, Conn., 10 Nov. 1837. He was graduated at Ohio Wesleyan

University in 1860 and has been professor of physics and astronomy in Tufts College since 1874. He has achieved eminence in scientific research, and among his numerous inventions are the writing telegraph (1863), the electric gyroscope (1867), the magnetic telephone (1876), the static telephone (1879), and the air-space telegraph cable (1882). Among his discoveries are the convertibility of sound into electricity (1873), wireless telegraphy (1881), and electric photography (1893). He has received several medals, including a bronze medal for an acoustic apparatus at the Centennial Exposition, Philadelphia, 1876, a silver medal in Paris 1881, and a gold medal in London 1882. Among his published works are: 'Chemical Tables'; 'The Art of Projecting'; 'The Speaking Telephone'; 'Matter, Ether, and Motion'; 'Modes of Motion'; and 'Natural Philosophy.'

Dolce, dōl'- or dōl'chā, or **Dolcemen'te**, in music, an instruction to the performer that the music is to be executed softly and sweetly.

Dolci, dōl'chē, Carlo or **Carlino**, kär-lē' nō, Florentine painter: b. Florence 25 May 1616; d. there 17 Jan. 1680. His works, which consist chiefly of madonnas and saints, exhibit the character attributed to him. The faces are full of a pleasing and tender softness, which, however, is often carried so far as to rob them of all character. Dolci's drawing is generally correct, his coloring exquisitely delicate and transparent, and in the nicety and laborious care of his finish he approaches the most characteristic examples of the Dutch school. His works are numerous and scattered over all Europe. Besides his madonnas his most famous works are his 'St. Cecilia'; 'Christ Blessing the Bread and Wine'; and 'Herodias With the Head of John the Baptist.'

Dol'cinites (from Dolcino, their founder), a Christian sect which arose in Piedmont in 1304. See Apostolic Brethren.

Dol'drums, a nautical term for the parts of the ocean near the equator that abound in calms, squalls, and light baffling winds; otherwise known as the horse-latitudes; also applied to the weather variations characteristic of those regions. See Calms, Region of.

Dole, Charles Fletcher, American Unitarian clergyman: b. Brewer, Me., 17 May 1845. He is a brother of N. H. Dole (q.v.). He has been pastor of the Unitarian Church, Jamaica Plains, Boston, from 1876. He is the author of 'The Citizen and the Neighbor'; 'Jesus and the Men About Him' (1888); 'A Catechism of Liberal Faith' (1895); 'The American Citizen' (1901); 'The Coming People' (1897); 'Noble Womanhood' (1900), etc.

Dole, Nathan Haskell, American writer: b. Chelsea, Mass., 31 Aug. 1852. He was graduated from Harvard 1874, and was literary and musical editor of the Philadelphia *Press* until 1887, when he became literary adviser to the publishing firm of T. Y. Crowell & Company. His principal original works are: 'Young Folks' History of Russia' (1881); 'A Score of Famous Composers'; 'Not Angels Quite'; 'On the Point' (1894); 'The Hawthorn Tree' (1895); 'The Mistakes We Make' (1898); and 'Omar, the Tent-Maker' (1898). In 1899 he edited the complete works of Count Tolstoi, whose novels, 'Anna Karenina,' 'War and Peace,' and many others he had already translated. He has also translated 'Maria y Maria,' 'Maximina,' and 'Sister St. Sulpice,' from the Spanish of Valdes, as well as various works from the French and German. In 1900 he edited a multivariorum edition of the 'Rubaiyat of Omar Khayyam,' containing many translations in English, French, German, Italian, Hungarian, and Danish carefully collated.

Dole, Sanford Ballard, Hawaiian politician: b. Honolulu, Hawaii, 23 April 1844. He studied law in Boston and was admitted to the bar in 1873, returning in the same year to Hawaii. In 1884 he was made a member of the legislature and again in 1886. He had been, in 1887, appointed an associate judge of the supreme court, under the monarchy, which post he resigned to accept the leadership of the revolution that overturned the monarchy in January, 1893, and established a provisional government. On 4 July 1893 a republic was formally proclaimed, of which he was elected president. After the annexation of Hawaii in 1898 he was appointed governor of the islands.

Dôle, dōl, France, town in the department of Jura, 26 miles southeast of Dijon. The manufactures are Prussian blue, hosiery, ironware, leather, vinegar, optical instruments, etc.; and the trade is chiefly in grain, flour, timber, wine, brandy, coal, iron, mill-stones, and marble. It possesses many ruins of Roman architecture. Pop. 12,750.

Dolerite, dŏl'ĕr īt, the name given to a class of rocks, including dolerite proper, basalt, and a few others. Dolerite itself consists of Labrador felspar and augite, with some titaniferous magnetic iron ore, and other minerals. It has a dark-gray color, crystalline, and small-grained, sometimes porphyroidal. Its specific gravity is 3. Its average composition is silica 50, alumina 15, oxide of iron 15, lime 10, magnesia 5, and the rest potash, soda, and water. It is found in great mountain masses, in beds and veins, in the Rhine district, in Iceland, in Guadaloupe, and other places.

Dolet, dō'lā", **Etienne**, a well-known French scholar and martyr: b. Orleans, France, 1509; d. Paris 3 Aug. 1546. At the age of 12 Dolet went to the University of Paris, where his attention was directed to the study which became the chief interest of his life — the writings of Cicero. In 1544, he was found guilty of heresy on a charge mainly based on an alleged mistranslation of Plato, in which he was accused of denying the immortality of the soul. After two years' imprisonment, Dolet was burned in the Palace Maubert, Paris. See Boulmier, 'Etudes sur le XVIème siècle: Etienne Dolet' (1875); Christie, 'Étienne Dolet, the Martyr of the Renaissance' (1899).

Dolgoruky, dōl gō roo'kē, **Katharina Michailow'na, Princess**, the favorite of the Czar, Alexander II., who married her in July 1880 after the death of his first wife, Marie. After the czar's death she lived abroad, and published in Geneva in 1882, under the pseudonym of Victor Laferté, 'Alexander II., Unedited Details of His Private Life and His Death.'

Dolichocephalic, dŏl"ĭ-kō-se-fāl'ik (from Gr. δολιχός long, κεφαλή a head); long-headed: a term used in ethnology to denote those skulls in which the diameter from side to side is

less in proportion to the longitudinal diameter (that is, from front to back) than 8 to 10. This form of skull is seen in an exaggerated form in native Australians and West Africans. The dolichocephalic skull of ordinary type appears among Indo-European races.

Dolichopodidæ, dol″ĭ-kō-pŏd′ĭ-dē, a numerous family of the order *Diptera*. They are small, metallic blue or green flies with slender legs and active habits. The larvæ live in the ground or in decomposing matter. They are not known to be harmful, but the flies are predaceous, and by this habit are beneficial to agriculture, catching, as they do, insects, and even worms, that are injurious to growing crops.

Dol'ichos (Gr. δολιχός long, that is, in pods), a genus of tropical herbs and shrubby plants of the natural order *Leguminosæ*. The 40 or 50 species, of which few are cultivated, are separated from species of the related genus *Phaseolus* by technical characters. The best known species are *D. lablab,* the hyacinth bean, a native of the tropics. It often twines around supports to a height of 20 feet, bears broad, often wrinkled leaves, purple, rather large flowers in erect, axillary racemes, and flat, rather smooth pods containing several small, black seeds. It is an annual, frequently planted in sunny situations to form temporary screens and arbor covers. It succeeds well in any good garden soil, but attains the greatest growth and bears the most foliage upon rich soils. It has several horticultural varieties. *D. sesquipedalis,* the French half-a-yard-long or asparagus bean, a native of South America, is cultivated for its green pods and mature seeds, which are used as esculents. The plant is an annual, twining or rambling plant, with rather large leaves and flowers and very long pods containing numerous small, oblong, usually reddish seeds. The pods sometimes exceed two feet in length and are sometimes curiously twisted. Several other species are used in Asia for food, but the two mentioned are the only ones of importance in the United States. See Soy Bean.

Doll, a favorite plaything of children, found in variety of form and decoration. Most of the dolls found in the stores are made in the village of Sonneberg, in the Thuringian forest, Germany. Here the industry of making children's toys can be traced back to the 17th century. Other villages in this vicinity and some towns in France and Switzerland also export large quantities of dolls to England and the United States. There are about 40 doll manufacturers in London who make dolls of a superior kind. In France expensive life-size dolls are manufactured. There are a number of doll factories in the United States, where of late years "doll shows," or bazaars, have been very popular. The phonograph doll, invented by Edison, created great interest when it was first introduced.

Dollar (Low German *daler,* from *thaler,* short for *Joachimsthaler,* coined 1519 from silver mines in Joachimsthal, Bohemia, and standard for weight and purity), the unit of American currency. The West India trade before the Revolution had made the Spanish dollar, more convenient than the sovereign, the real unit of trade here; and the Coinage Act of 2 April 1792, merely legalized this fact, establishing the dollar as the unit of American currency, making it equivalent to 24.75 grains of fine gold, and authorizing the coinage of silver dollars "of the value of a Spanish milled dollar the same as is now current" (see also Cent), and of halves and quarters correspondent. The first actual coinage was in 1794, dollars of 416 gr., 371.25 silver, .8924 fine. The dollar of account was rated at 4s. 6d. sterling, making the pound equal to $4.44; which, as the sovereign was 113 gr. gold, was too little, and should have been $4.565. By act of 28 June 1834, the gold in the dollar was reduced to 23.20 gr., raised 18 Jan. 1837, to 23.22, where it remains, the pound having been unchanged, has since been equal to $4.86⅔. The last act made the weight of the silver dollar 412.5 gr., but raised it to 900 fine, the amount of silver remaining the same as before, 371.25 gr. On 3 March 1849, a coinage of gold dollars was authorized, weight 25.8 gr., .900 fine, 23.22 gr. pure gold; on 21 Feb. 1853, a $3 gold piece, same fineness, 77.4 gr.; and half and quarter dollars of silver, 192 and 96 gr. respectively, but legal tender only to $5. The act of 1873 discontinued the coinage of the silver dollar of 412.5 gr., but authorized one of 420 gr. (the "trade dollar") for the China and Japan trade. The fall in silver shortly after, however, (at this time the silver dollar was worth rather more than the gold), inflated its value and made bullion owners anxious to have their metal coined into these, and on 22 July 1876, their coinage was limited to the actual demand for export, they not being intended for internal circulation — 35,959,360 were issued in all. The coinage was suspended April 1878. The act of 28 Feb. 1878, revived the coinage of the dollar of 412½ gr., and that of 14 July 1890, continued it. It is notable that many times more silver dollars have been coined since 1873 than before; up to 30 June 1872, the total number struck was only 8,045,838, while that of gold dollars was 19,015,642. The act of 14 March 1900 makes the gold dollar the standard of value in the United States.

Dollar-fish, a name used, particularly in Maine, for a small fish of the family *Stromateidæ,* more widely known as the butter fish or harvest fish (*Rhombus triacanthus*). It is found on the entire extent of the Atlantic coast of the United States, and is extremely abundant during the summer on the shores of the New England and Middle States. The dollar-fish is from 8 to 10 inches long, of an oval form, with a blunt snout and small mouth; the color is silvery, bluish above, beautifully iridescent when alive. Great numbers are captured in seines and pound nets and they are highly valued as pan-fish. The young have an interesting habit of swimming, several together, in the company of large jellyfishes, beneath the disks of which they seek shelter and protection. Several allied species occur on both the east and west coasts of the United States.

Dollart, dŏl′lärt, **The,** a gulf of the North Sea, at the mouth of the Ems, between the Dutch province of Groningen and the Prussian province of Hanover. It was formed by inundations of the sea, which took place in 1277 and subsequently, overwhelming many large villages and hamlets, and destroying thousands of human beings, besides much valuable property. A

considerable extent of rich land has been reclaimed by embankment.

Döllinger, del'ling-er, John Joseph Ignatius, German theologian and historian: b. Bamberg, Bavaria, 28 Feb. 1799; d. 12 Jan. 1890. He studied at Wurzburg, took priest's orders in the Roman Catholic Church in 1822; taught for several years in the Lyceum at Aschaffenburg, and in 1826 was appointed professor of ecclesiastical history and law in the University of Munich. He held this position until 1871, when he was elected rector of the university. His connection with politics began in 1845, when he represented his university in the Bavarian chamber, and in 1848 he was elected to the Frankfort parliament by a Bavarian constituency. In the early part of his career Dollinger was the zealous leader of the Ultramontane party in Germany, and his learning as well as his faith found expression in his 'Treatise on the History of the Church' (1838); 'The Reformation, its Interior Development and its Effects' (1846–8); and 'Luther' (1851). In 1857 he visited Rome, and soon afterward it became evident that his views had undergone a change. Public announcement of this was made in a course of lectures which he delivered at Munich, in which he declared the temporal power of the Pope not an essential part of the Roman Catholic Church, and he expounded this position in a treatise on 'The Church and the Churches' (1861). This attitude of opposition became more pronounced in 1870, when he declined to accept the doctrine of papal infallibility formulated by the Vatican Council, and assumed the leadership of the Old Catholic party. As a result Dollinger was excommunicated by the Archbishop of Munich, but still retained the support of the Bavarian government. In 1874 he presided over a conference of Old Catholics at Bonn, and here he declared that he did not hold himself bound by the decisions of the Council of Trent. In his latter years Döllinger's activity as an author was shown in his 'Materials for a Life of Bellarmin' (1887), and two volumes of 'University Lectures' (1888–9). See Kobell, 'Ignaz von Döllinger, Erinnerung' (1891); 'Life,' by Friedrich (1899–1901). See Old Catholics.

Dol'liver, Jonathan Perkins, American lawyer and politician: b. near Kingwood, Preston County, W. Va., 6 Feb. 1858. He was graduated at West Virginia University 1875 and admitted to the bar 1878. He practised law in Iowa and was a member of Congress from that State for several successive terms. He was appointed United States senator to fill a vacancy and was elected in 1903 for the term ending 1909.

Dollman, John Charles, English artist: b. Hove, 6 May 1851. He was educated in the Royal Academy Art Schools and received a bronze medal at the Paris Exhibition in 1900. Among his works may be named: 'Not Worth Powder and Shot'; 'Warranted Quiet to Ride or Drive'; 'Judas'; 'Gold'; 'Temptation of St. Anthony'; 'Kismet.'

Dollond, John, English optician of French descent: b. London 10 June 1706; d. there 30 Nov. 1761. He devoted his attention to the improvement of refracting telescopes, and succeeded in constructing object-glasses in which the dispersion of the rays of light was corrected. Subsequent members of his family have distinguished themselves in optics, astronomy, etc.

Doll's House, The, one of the best known plays of Henrik Ibsen, published in 1879. It pictures woman as a doll, from whom nature has removed the unused faculties which produce clear thinking and business-like action. Nora, the doll in question, is sweet, childish, ignorant. For the sake of her husband she forges her rich father's name without realizing her guilt. Disclosure of her act brings her face to face with the realities of life, and she leaves her husband's house. An English version of the play was produced in London in 1889.

Dolly Varden, the soft-hearted, wily little coquette in Dickens' novel 'Barnaby Rudge.' The impression made by the author's description of her dress of flower-sprinkled dimity led to the adoption of a style of dress that is known as the Dolly Varden. The name is often applied to any light dress-goods with bright-colored flower effects.

Dolly Varden Trout, the common brook trout (*Salvelinus malma*), of western North America, so called because of the beauty of its markings, which are said to resemble the coloring of a Dolly Varden (q.v.) dress. The trout often attains a weight of 12 pounds. In the region of its native waters it is known as the bull-trout, red-spotted trout, and malma. It has been used to stock streams in the northeastern States, Canada, and Europe.

Dol'man, a long robe worn by the Turks as an upper garment. It is open in front, and has narrow sleeves buttoned at the wrist. It has given its name to a kind of loose jacket worn by women as an outer garment. It has a cape or hanging piece over the arm instead of a sleeve.

Dol'men, a structure consisting of one large unhewn stone, resting on two or more unhewn stones, placed erect in the earth. The name is sometimes used as equivalent to cromlech, sometimes in a distinctive sense. Sir John Lubbock maintains that cromlech should be applied to a stone circle, dolmen to a stone chamber, such circle or chamber consisting of huge stones set up often in prehistoric times for religious or sepulchral purposes or as memorials of some important event.

Dolnja Tuzla, dōl'nyä tooz'lä, Bosnia, town about 20 miles from the Servian frontier Pop. 10,227.

Dolomieu, Déodat Guy Silvain Tancrède Gratet de, dā-ō-da gē sīl-vāñ tāñ krād grä-tā dė do-lo-mē-ė, French geologist and mineralogist: b. Dolomieu (Isère) 24 June 1750; d. Chateauneuf, France, 26 Nov. 1801. He was appointed correspondent of the Academy of Sciences of Paris, and from 1777 to 1791 made extensive travels in the south of Europe, often on foot, with a hammer in his hand and a bag on his back. In 1796 he was appointed professor or lecturer in the School of Mines, and on the establishment of the Institute was made a member of that society. In 1801 he received the professorship of mineralogy in the museum of natural history. Among the works left by him are 'Voyages aux Iles de Lipari' (1783); 'Sur le Tremblement de Terre de la Calabre' (1784); 'Philosophie Minéralogique' (1802).

Dol'omite, carbonate of calcium and magnesium ($CaMgCO_3$) containing normally 30.4 parts lime and 21.7 parts magnesia, but varying in the ratio of the two carbonates. Iron and manganese carbonates are sometimes present as impurities. The crystallization is rhombohedral; the hardness 3.5 to 4; specific gravity 2.8. The color is normally white but may be reddish, grayish, brownish, or even black. In general the mineral resembles calcite but differs in not effervescing freely with cold acid, even if finely powdered. Massive dolomite in the form of dolomitic limestone is a rock of common occurrence and sometimes forms strata of great extent and thickness. Such limestones frequently show all transitions from nearly pure calcite to true dolomite. Generally, a limestone containing over 5 per cent MgO is described as a magnesian limestone. Under pressure dolomitic limestones and dolomites become crystalline and are classified as marbles. Many of the great limestone formations in the United States are more or less dolomitic. See DOLOMITIZATION; LIMESTONE; ROCKS.

Dolomite Mountains, or Dolomite Alps, a group of mountains, part in Tyrol and part in Italy. The name comes from the mineral dolomite, found in large quantities in these mountains.

Dolomitiza'tion, the process by which the calcium in limestones is replaced by magnesium, forming dolomitic limestones and dolomites. The exact nature of this process is still a matter of doubt. Dolomites cannot be formed directly from the calcareous remains of animals, since they contain a much larger proportion of magnesia than any animal shells or tests, and the magnesium therefore was probably added after the calcareous material had accumulated. In the lagoons of coral reefs, the enclosed body of sea water becomes concentrated by evaporation, and the chloride of magnesium (present in all sea water) by a process of double decomposition forms magnesium carbonate from the calcium carbonate of the coral rocks. It is also possible that fine calcareous mud in suspension in sea water may exchange some of its calcium directly for magnesium. See DOLOMITE.

Dolores, dō-lō'rĕs, El Grito de, literally, "The cry, or outcry, of Dolores," marking the commencement of the Mexican war for independence. On the night of 16 Sept. 1810, Don Miguel Hidalgo y Costilla, the parish priest of the town of Dolores (q.v.), gathered a number of patriots under his banner to the cry of: "Long live religion! Long live our Most Holy Mother of Guadalupe! Long live America, and death to bad government!" All previous attempts (1798–1810) to rebel against the Spanish authorities had been suppressed; but Hidalgo and his enthusiastic followers were victorious in several engagements. Although he and his lieutenants, Allende, Aldama, and Jimenez, were captured and put to death in 1811, the movement they began was carried on until the revolutionists triumphed, 27 Sept. 1821, Yturbide entering the capital on that day. See MEXICO.

Dolores Hidalgo, ē-dāl'gō, Mexico, a town in the state of Guanajuato, department of Allende, about 41 miles from the capital of the state, which is also called Guanajuato. Pop. 6,000.

Dolph, John Henry, American painter: b. Fort Ann, N. Y., 18 April 1835; d. New York, 28 Sept. 1903. He studied at Antwerp, and in Paris, then opened a studio in New York; he was a member of the National Academy. His works include: 'Knickerbocker Farm Yard'; 'Season of Plenty'; 'Horse Doctor'; 'A June Day'; 'Who Will Bell the Cat'; 'Cat and Kittens'; 'A Princess'; 'Fish Commissioners'; 'Alexander and Diogenes'; 'The Waste Basket'; 'A Society Lion'; and 'Called to Order.' His pictures of animals, and particularly cats, are best known.

Dolph, Joseph Norton, American statesman: b. Dolphsburg, N. Y., 19 Oct. 1835; d. Portland, Ore., 10 March 1897. He studied law, and began practice at Binghamton, N. Y. In 1862 he settled in Portland, Ore., taking up the practice of law there. In 1864 he was elected city attorney, and was appointed United States district attorney. He was a member of the State Senate four consecutive terms, was elected to the United States Senate in 1883, and re-elected in 1889. In his second term he was chairman of the Committee on Coast Defenses, a member of the Committee on Commerce, and an active opponent of the free coinage of silver.

Dolphin, a group of cetaceans belonging to the family *Delphinidæ*. The common species (*Delphinus delphis*) is found chiefly in the Mediterranean and North Atlantic Ocean. It is from six to eight feet long; the body tapers toward the crescent-shaped tail, which is about a foot broad. The blow-hole is also crescent-shaped; and the beak is usually about six inches long. The dolphin is blackish on the back, and white below, the sides being gray. The female produces but one at a time, and devotes herself assiduously to caring for it. There are numerous species of dolphin, each confined, apparently, to a comparatively narrow range. All are voracious, and feed on other fish and various marine animals, eating, it is said, even the disabled and feeble of their own kind. They live in herds or "schools," and may be seen by ocean voyagers playing about the vessels. They will leap in graceful curves, into the air, make sudden descents into and through the waves, followed by a track of foam. Then they will re-appear, show their slender back-fins, expose their broad tails as they plunge below the water; and almost before one has missed them, they will rise on the other side of the ship. They are a source of pleasure to the ocean traveler; and furnish more substantial gratification to the sailors, who eat their flesh with much relish after their usual rations of salt-pork. The grampus, the porpoise, and many of the so-called whales, such as the white-whale, the killer-whale, and others, are related genera; as are also the soosoo of the Ganges, and the bouto of the Amazon, which inhabit fresh water instead of the ocean. Consult Beddard, 'A Book of Whales' (1900).

Domain', from the Latin *dominium*, right of ownership, property, dominion. The territory over which dominion is exercised; the territory ruled over by a sovereign, or under the government of a commonwealth, as the domains of Great Britain. The term public domain is used in Europe, as property belonging directly to and controlled by the state; such as lands

set apart for state or public uses, roads, canals, parks, etc. In the United States the lands owned by the Federal government or by a State.

Dom'bey and Son, a novel by Charles Dickens, published in 1848. It represents a man of proud and unbending nature who centres his worldly ambitions in an only son, but who becomes broken and subdued by his child's death, family disgrace, and financial ruin.

Domboc, dōm'bōk, or **Doom-book** (A. S. "book of dooms or sentences"), the code of laws compiled by King Alfred, who made few if any original laws, but contented himself with restoring, renovating, and improving those which he found already in existence. Alfred's religious character is strongly impressed on his code, which begins with extracts from the Bible. Then follow the Ten Commandments, the part of the Mosaic law relating to criminal offenses, and passages from the New Testament, including the Golden Rule. The code was ratified by the Witan, as Alfred expressly informs us. Thorpe gives it in his "Diplomatarium Anglicanum ævi Saxonici" ('English Diplomatarium of the Saxon Era') (1865).

Dombrowski, Jan Henryk, yān hĕn'rĭk dōm-brŏf'skē, Polish general: b. Pierszowice near Cracow, 29 Aug. 1755; d. Wina-Gora, Prussia, 6 June 1818. After serving under the Elector of Saxony he returned to take part in the Polish campaigns against Russia and Prussia in 1792–4. Next entering the French service, he organized a Polish legion at Milan; and in the campaigns which followed, Dombrowski and his Poles took a distinguished part. After the fall of Napoleon he returned to Poland and was appointed by the Emperor Alexander a general of cavalry and Polish senator.

Dome. See CUPOLA.

Dome of the Rock, a name given to the Mosque of Omar, Jerusalem. It stands on Mount Moriah, on the site once occupied by the Temple of Solomon. Immediately under its dome is an irregular-shaped rock. This rock was the scene of many scriptural events, and has been greatly revered for ages. See JERUSALEM.

Domenichino, dō"mā-nē-kē'nō, or **Domenico Zampieri,** Italian painter: b. Bologna 28 Oct. 1581; d. Naples 15 April 1641. He was sent to study first with Calvart, and afterward with the Carracci. From the slowness of his execution he was named, by his fellow-students, the "ox of painting"; but Annibal Carracci predicted that the ox would "plough a fruitful field." Having contracted a great friendship for Albano he joined him at Rome, and his former master, Annibal Carracci, jealous of Guido, procured for him the execution of one of the pictures for a Roman Catholic church which had been promised to that great painter. It was a custom with Domenichino to assume, for a time, the passion he was depicting; so that, while working by himself, he was often heard to laugh, weep, and talk aloud, in a manner that would have induced a stranger to suppose him a lunatic. The consequence, however, was, that few painters have surpassed him in lively representation. His 'Communion of St. Jerome' has been considered, by some connoisseurs, inferior only to the 'Transfiguration' of Raphael; and the 'History of Apollo,' which he painted in 10 frescoes for Cardinal Aldobrandini, is also much admired. His merit excited so much envy that he retired to his native city and employed himself two years on his famous picture of the 'Rosary.' He was afterward recalled to Rome (1621) by Gregory XV., who created him his first painter and architect of the Vatican. Losing this post after the Pope's death, he accepted an invitation to Naples, to paint the chapel of St. Januarius. But here he encountered a jealousy so rancorous that his life became altogether embittered by it; and so great was his dread of poison, that he prepared all his eatables with his own hand. Domenichino, who understood every branch of his art, produced nothing excellent without study and labor; but in consequence of his great premeditation, no painter has given his pieces more of the properties belonging to the subject. At the same time his designs are correct; and he succeeded equally in the grand and the tender. Nearly 50 of his pieces have been engraved.

Domestic Animals. See DOMESTICATION.

Domestic Science in Schools, the branch of study that is concerned with household economics as a part of the school curriculum. The introduction of manual training into American public schools naturally led to the development of sewing and cooking as branches of study for girls, and courses of this kind have been established in the grammar schools and high schools of many of the large cities throughout the country. In many cities there are manual training high schools with domestic science as a strong feature. The manual training high school of Kansas City offers domestic art as an elective, and was able in 1902–3 to accommodate 650 girls in one-, two-, and three-year classes. Downer College, Milwaukee; the State College of Agriculture, Ames, Iowa; the Minnesota State Agricultural College; the State Normal School at New Paltz, N. Y.; are only a few of the many institutions where a thorough training is offered. In New York the following institutions are teaching domestic science in all or part of its phases: Teachers' College; the Manhattan Trade School for Girls; the Girls' Technical High School; Pratt Institute, Brooklyn; the Hebrew Technical School for Girls; and the evening public schools of Manhattan, Brooklyn, and Queens.

A normal course in domestic science covers three years. The work of the first year includes psychology, history of education, chemistry, physiology, drawing, cord-work, weaving, basketry, sewing, cooking, and physical training. At the end of the first year the student is able to decide whether she is best qualified to teach domestic science or domestic art. If the latter specialty is preferred she takes advanced sewing, dressmaking, millinery, drawing, water color, design, history of costume, embroidery, normal methods, and bacteriology. Into such training embroidery as mere fancy-work does not enter; art principles and educational significance being determining factors, and individuality being demanded in the student's work. She must be something more than a skilful needle-woman.

The same philosophical attitude is preserved in the teaching of cookery, and the young woman trained in these normal classes is not a simple cook; she is a chemist and a dietary expert, understanding both the theory and the practice of

her art. It is evident that educators do not view the subject from a merely utilitarian view-point. The educational value of domestic science and art are recognized and emphasized. As instructors in these branches, women of sound education and thorough professional knowledge are required. Schools and colleges in all parts of the country are demanding such teachers; and the vacation schools, settlements, and other institutions of all large cities in the East claim a large number of them. One sphere which is opening to women with such qualifications is that of the dietary expert in penal and philanthropic institutions. A field so large as that offered to graduates of schools of domestic science and art will not soon be overcrowded.

Domestica'tion, the modification of animals by deliberate interference with their food and surroundings, with the work of functions they perform, but especially with their breeding. Man has exterminated some animals — for example, birds, and propagated others — for example, fishes; he has made many become rare, shy, and cunning, while others (for example, dogs and cats) find shelter in his dwellings; he has kept some captive, like the fish in the pond; tamed others for his service, like horses and oxen; he has preserved some artificially from their enemies, because of their rarity, and others because of their utility. When a distinct breed has been produced by human interference, in most cases deliberately by artificial selection, we call the result domestication. Strictly "domesticated animals" correspond to strictly "cultivated plants"; in both cases the organisms have been modified, more or less fixedly, from their natural or wild state, by changes in food and environment, function, and breeding.

Domestication began long before the dawn of history (see AGRICULTURE; ANTHROPOLOGY; DOG). Among lower animals, silk-moths (see SILK) and hive bees (q.v.) have been for long controlled, and to a limited extent modified. Among fishes, gold-fish (q.v.) may certainly be regarded as domesticated for decorative purposes. Birds include many illustrations of domestication — pigeons, fowls, ducks, geese, peacocks, turkeys, guinea-fowls, canary-birds, etc. Among mammals, dogs and cats, horses and asses, cattle, sheep and goats, elephants, camels, reindeer, pigs and rabbits, etc., have been domesticated, and have given rise to many different breeds. The complete list is not a long one, yet probably it will not be increased. To admit of domestication, animals must generally be social and docile in their habits, and must be capable of retaining fertility under changed conditions.

The process of domestication, as far as deliberate control is concerned, is for the most part equivalent to selective breeding. Different breeds differ from natural species in being usually mutually fertile. In other words, while two domestic races may be externally more different than are two nearly related species in nature, the reproductive elements in the first case cannot differ as they must do in the second. Thus crossing is usually successful between domestic breeds, only rarely between adjacent natural species. When we pass beyond selective breeding to inquire into the conditions of variation, a much more difficult problem is raised. In regard to some changes which crop up in domestic animals, we cannot do more at present than refer them to variations in the unstable germ-cells, and to the intermingling of sexual reproduction. Where the intercrossing is regulated, the importance of the latter is especially obvious. These germinal changes may, however, as the organism grows, find expression in the continually variable rhythm between nutrition and reproduction, between growth and multiplication — the great antithesis of organic life. But while considering this internal aspect, we have at the same time to recognize the importance of external influences, especially of altered climate and diet. These hinder or abet the constitutional or inherited tendencies, and may in course of time bring about important new results. Domesticated forms are more variable than their wild relatives; the males are more variable than the females; and the offspring of hybrids are more unstable than the hybrids themselves.

The results of domestication are very varied. Sometimes the changes induced and cultivated have been comparatively slight, in other cases they have amounted to the evolution of new species. These changes are abundantly illustrated in Darwin's classic work on variation under domestication.

Domett, dŏm-ĕt' or dŏm'ĕt, **Alfred,** English poet: b. Camberwell, Surrey, England, 20 May 1811; d. London 12 Nov. 1887. He was the original of Browning's 'Waring.' He lived in New Zealand, 1842–71, and became a colonial statesman of eminence. His verse attracted much attention, the best specimens being in the volumes 'Ranolf and Amohia' (1872); and 'Flotsam and Jetsam: Rhymes Old and New' (1877). See Gisborne, 'New Zealand Rulers and Statesmen' (1897).

Domicile is the permanent, fixed home of a person, with no present intention of removing therefrom. A person traveling from one city, State, or country into another does not change his domicile and create a new one at every place he stops, but the place to which he intends to return and reside permanently is his domicile. Generally speaking, a person can have but one domicile at one time; but for different purposes, he may have more than one domicile at one time. Some things for which it is necessary to have a domicile are: administration of a person's estate, jurisdiction, taxation, and homestead exemptions. In America, the place at which a person exercises his political rights and privileges, and which he calls his home, is considered his domicile. The two things necessary to a domicile are an actual residence and a present intention of remaining there.

After a person has once acquired an actual domicile, he does not lose it by a temporary absence, no matter how long it is continued, if he intends to return; and in cases where a person changes his domicile he does not lose the old place of domicile, until he has actually acquired the new one. While the intention of the person enters into the question of domicile, it is not a controlling feature; and in a change of domicile the intention must be reinforced by some act, such as exercising a political right, engaging in business, paying taxes, and executing a will, according to the laws of the place; all of which are evidence of the intention to create a new domicile. When persons are mar-

riage the wife acquires the domicile of her husband, and all children born acquire the domicile their father had at the time of their birth. If a widow with minor children marries, the domicile of the children is not changed until there is an actual removal. Illegitimate children acquire the domicile of their mother in some jurisdictions, if acknowledged by their father, they acquire his domicile.

A person absent from home on the service of his government, such as an ambassador, consul, soldier, or sailor, does not change his domicile; unless, after the service is finished, he continues to reside at that place. A convict or prisoner, a person attending a college or university, does not change his domicile. A person may acquire a commercial domicile in a place different from that in which he lives. When a person goes to a foreign country and engages in business there, he is considered a merchant of that country; and it makes no difference what the relations of the government of the countries are with one another.

A guardian cannot change his ward's domicile from one country or State to another; and it is doubtful even if he can change the domicile from one county to another in the same State. The nature and purpose of the appointment of a guardian may, however, change the general rule. The appointment of a guardian will not prevent the ward from changing his domicile. Although the domicile of the wife is considered as that of the husband, yet in actions for divorce, a husband, after giving his wife a cause for divorce, cannot acquire another domicile so as to deprive her of that right. In wills, the law of the domicile of the testator governs as to the validity of the execution and the distribution of personal property; but as to real estate, if it is to pass under the will, the testator must execute the will according to the laws of the place where the property is situated. Corporations are considered as domiciled in the county or State from which they have derived their charters.

Dominant, in music, is the fifth note above the tonic or keynote of any scale. It is always major in both major and minor modes, as its harmonies rule or determine the scale. Originally so called because in the ecclesiastical system it was the principal reciting note of the Gregorian chant. It also marks the division of the scale into two co-ordinate parts, as in a fugue when the subject commences with the tonic the answer starts with the dominant, or the reverse. In the sonata form it used to be an almost invariable rule to start the second subject in the dominant key.

The *dominant chord* is the major triad on the fifth of the major or minor key. Thus of *C* the triad would be *g-b-d*. A *dominant seventh* is formed by adding a minor seventh to the triad. Add *f* to the dominant triad given above and you have the dominant seventh of *C*.

Domingo, San. See San Domingo.

Dom'inic, Saint, founder of the order of Dominicans or Preaching Friars: b. Calahorra, in Old Castile, Spain, 1170; d. Ravenna, Italy, 6 Aug. 1221. According to the legendary story of his life his future eminence in the Church was foreshown to his mother before his birth by preternatural premonition, for she dreamed that she saw a dog presenting to her child a flaming torch with which to set the world ablaze. This explains the meaning of the dog with torch in his mouth, seen in many pictures of Saint Dominic. In childhood he gave signs of extraordinary piety and love of ascetic practices. At 17 he entered the University of Palencia (removed later to Salamanca), and devoted himself to the study of philosophy and ancient literature. Here he once sold his clothes in time of famine to obtain the means of relief for the poor; on another occasion he offered himself to be a slave to the Moors in exchange for a widow's only son. He stayed in the university 10 years, and, having been ordained priest, was made a member of the cathedral chapter of Osma, and in that station was the zealous assistant of the bishop in suppressing abuses in the Church. He accompanied this bishop on an embassage to France in 1203, and in passing through Provence was grieved by the extreme laxity of morals in clergy and laity and the alarming progress of the various Manichæan sects. Dominic vowed himself to a life of evangelical labor among those sectaries, and resolved to make all possible efforts for the correction of the evils which menaced the existence of the Church in those parts. There were already in the field legates commissioned by the Pope to win the erring back to the fold; but Dominic was scandalized by their worldly pomp, and declared that not in costly attire and with a showy retinue should they approach the misguided Albigensians and poor men of Lyons, but barefoot and without purse or scrip; and the papal envoys, persuaded by the words of the zealous evangelist, laid aside their state and for a while followed the examples of humility and zeal set by Dominic. But their preaching proving unfruitful, they retired from the field and reported to Rome their failure. Nor was Dominic himself rewarded with much success, though the annals of his life tell of great miracles which attended his progress through the country. Then resort was had to force, and a crusade against the Albigensian heretics was proclaimed; which was conducted by Simon de Montfort with extreme severity till, at his death in the siege of Toulouse, resistance on the part of the Albigenses was overcome. No proof exists that Dominic either prompted the crusade or had any part in it; but it is certain that he was a friend of Simon de Montfort and of his family. He quit the country in 1217, one year before the end of the war, and withdrew to Rome where he spent the remainder of his life in organizing the order of Preaching Friars. He arranged the prayers and meditations of the devotion called the 'Rosary,' much in use by Roman Catholics in all parts of the world. See Dominicans; Rosary. Consult: Drane, 'Life of Saint Dominic'; Lacordaire, 'Vie de Saint Dominique.'

Dominica, dŏm-ĭn-ē'kà, or **Dominique**, dōm-ē-nēk', West Indies, an island in the northern half of the Caribbean chain of the Lesser Antilles. (See Antilles.) It is the largest of the British Caribbees, being 29 miles long, 16 miles broad, and having an area of 291 square miles; it has also the highest summit of this volcanic island chain, the Morne Diablotin (5,314 feet), several thermal springs, and an old crater-lake about 2,800 feet above sea-level which formerly "was flooded by boiling water from springs bubbling up from the bottom, and every

five minutes upheaving in a foaming geyser." The area of this lake was diminished by landslides which occurred in 1880, but it is still of great depth. The rainfall of the island is very abundant. The summer temperature is about 80° F.; that of winter, spring, and autumn about 70° F. An interesting part of the population is a group of Caribs (q.v.), though these aborigines are now largely mixed with the blacks. "They inhabit the mountains of the interior, and make their livelihood by weaving a peculiar basket which is universally used in the island for carrying baggage." The blacks referred to, descendants of African slaves of the period when Dominica belonged to France, are by far the most numerous element; they, as well as most of the white inhabitants, speak a French patois, and "still look upon the British owners as foreigners." With the exception of the Indians, the people live near the coasts. In the luxuriance and beauty of its vegetation, Dominica excels the other neighboring islands. Its soil is a rich brown mold, in which all tropical products grow readily. Of its 186,240 acres, two thirds are crown lands, but the government has utterly failed to promote agriculture, which is now nearly ruined. Exports are cattle, cocoa, lime-juice, rum, molasses, and sugar. The revenues do not equal expenditures, and taxes are increasing. Dominica is a presidency, belonging to the British Leeward Island administrative group, which includes also St. Christopher, Nevis, Antigua, Barbuda, Montserrat, Redonda, and the British Virgin islands, the seat of the Leeward government being at St. John, Antigua. The local government is conducted by a commissioner, or president, an executive council of seven members, and a legislative assembly. These officials exercise their authority at the small town of Roseau, which is situated on the western side of the island, and has wide and regularly paved, but deserted, streets, a botanical garden, a public library, and French (Catholic) and English churches. The name of the island (from Spanish *Domingo*, Sunday) is due to the circumstance that Columbus discovered it on the first day of the week, 3 Nov. 1493. The warlike Caribs retained control of it during two centuries, but little by little French settlers gained a foothold, and in the 18th century its possession was regarded as essential to the maintenance of French prestige in the West Indies, owing to its situation between the important dependencies of that country, Martinique and Guadeloupe. For that very reason the English insisted upon its surrender, in the final balancing of international accounts after the imperial wars, early in the last century. Many laborers have migrated to South America in search of employment. R. T. Hill says, in his 'Cuba and Porto Rico, with the Other Islands of the West Indies': "Formerly the slopes of Dominica were covered with coffee-trees, but this industry has practically disappeared. In 1843 there there was as much as 1,333,000 pounds of coffee, besides rum, sugar, and molasses. The coffee culture even reached 2,500,000 pounds in 1828. Now the whole of this industry has vanished, except a few trees set out within recent years. Faint attempts are being made to increase the production of cocoa, limes, and lime-juice, as well as of essential oils." It would be fairer, however, to ascribe Dominica's economic decline to the low price of both of her natural products, sugar and coffee. The population in 1881 numbered 28,211; a decade later it was only 26,841; and the exodus still continues.

Domin'ical Letter (from Lat. *Dominica*, Sunday), properly called Sunday letter, one of the first seven letters of the alphabet used in calendars to designate the Sundays throughout the year. The ancient Romans used the first eight letters, A–H, to denote their nundinal period; the early Christians dropped the eighth and adopted the remaining seven to indicate the days of the Hebrew week. These seven letters are employed to show on what days of the week the days of the month fall throughout the year. One of those seven letters must necessarily stand against Sunday, and is printed as a capital, and called the dominical letter or Sunday letter; the other six being inserted in different type, to denote the other six days of the week. Now, since a common Julian year contains 365 days, if this number be divided by seven (the number of days in a week), there will remain one day. If there had been no remainder it is obvious the year would constantly begin on the same day of the week; but since one remains, it is plain that the ordinary year must begin and end on the same day of the week; and therefore the next year will begin on the day following. Hence when January begins on Sunday, A is the dominical or Sunday letter for that year; then, because the next year begins on Monday, the Sunday will fall on the seventh day, to which is annexed the seventh letter, G, which, therefore, will be the dominical letter for all that year; and as the third year will begin on Tuesday, the Sunday will fall on the sixth day; therefore F will be the Sunday letter for that year. Whence it is evident that the Sunday letters will go annually in retrograde order, thus, G, F, E, D, C, B, A; and in the course of seven years, if they were all common ones, the same days of the week and dominical letters would return to the same days of the months. But because there are 366 days in a leap-year, if the number be divided by seven, there will remain two days over and above the 52 weeks of which the year consists. And therefore, if the leap-year begins on Sunday, it will end on Monday; and as the year will begin on Tuesday, the first Sunday thereof must fall on 6 January, to which is annexed the letter F, and not G, as in common years. By this means, the leap-year returning every fourth year, the order of the dominical letters is interrupted, and the series cannot return to its first state till after four times seven, or 28 years; and then the same days of the month return in order to the same days of the week as before. This method of indicating the days still holds its place in Church calendars without variation from the beginning.

Dominican Republic, West Indies, a country which occupies the eastern and central portions of the island of Santo Domingo, or Haiti: bounded on the north by the Atlantic Ocean, on the south by the Caribbean Sea, on the west by the republic of Haiti, and separated by the Mona Passage from Porto Rico on the east. Its area is commonly estimated at 18,045 square miles.

Political Divisions.— The country is divided into six provinces and five maritime districts, each administered by a governor appointed by

the president; the governors, in turn, appoint the prefects who preside over communes, cantons, and sections. Principal cities and villages are: The capital, San Domingo city (q.v.), regarded as one of the most perfect specimens of a 16th century Spanish-American town, but now in decadence; Santiago de los Caballeros (q.v.), also one of the oldest places in the New World, situated in the northern plain called Vega Real, about 100 miles northwest of the capital; Puerto Plata, on the north coast, connected by rail with Santiago; Concepcion de la Vega, on the river Camu, near Santiago; Azua de la Compostella, on the south coast, about 55 miles west of San Domingo city; Samaná, on the bay of that name; Monte Cristi, on the north coast; and Seybo, 50 miles northeast of the capital. The last four are very small places, of 1,000 to 5,000 inhabitants.

Outlying Territory.— For adjacent islands see SANTO DOMINGO, ISLAND OF. Some of the general physical characteristics of the main island are also discussed more fully in that article.

Topography and Physical Geography.— The mountains — the centre and culmination of the Great Antillean uplift — form several cordilleras or roughly parallel ranges. The highest peak, Mount Tina (10,300 feet), is northwest of San Domingo city, and near the centre of the island are numerous peaks from 8,000 to 9,000 feet high. While the enormous mass of these mountains, occupying four fifths of the island, renders much of the territory nearly inaccessible, between the ranges lie plains, some of which are wonderfully fertile. Toward the north and west are the famous Vega Real and the plain called Despoblado de Santiago; near the south coast the rich valley of Baní, which extends between the Nizao and the Ocoa; and in sequence the valleys of Azua, San Juan, or Antigua Maguana, Santo Tomé, Onceano, Hincha, Quava, and others; toward the east, extending even to Cape Engaño, is a region in which the *praderias* or *llanos* — valleys, meadows, or plains — are most common. Even the ridge of the Cibao Mountains sinks to a height of only 1,000 feet at its eastern end.

Rivers and Harbors.— The Ozama and Isabela rivers unite to form the port of San Domingo after receiving the waters of many smaller streams, such as the Yavacao, the Monte Plata, and the Savita. The Haina, or Jaina, which empties into the sea about 10 miles west of San Domingo city, and the Nigua, whose course is still farther toward the west, enclose a very beautiful plain which was a source of wealth during the Spanish period. The Nizao flows southward between fields of sugar-cane and meadows where herds of cattle graze. Other rivers are the Artibonito, Yaqui, Yuna, Naranja, and Magua. The coast-line, about 940 miles in extent, includes the Bay of Samaná — a well-sheltered harbor extending westward from the Mona Passage, its average width being 12 or 13 miles and its length more than 25 miles. It has been pointed out that this bay would accommodate the largest fleets, and that defensive works placed at its entrance would make it practically impregnable; its strategic value is certainly so great that it should be reckoned one of the republic's chief assets. The other open ports are: on the north, Puerto Plata, Monte Cristi, Macoris, and Sanchez; on the south, San Domingo city and Azua.

Geology and Mineral Resources.— The geology of the island, as described by Blake, Marvin, and others, is similar to that of the eastern ends of Cuba and Jamaica. There are, according to Robert T. Hill, four principal formations: "the older mountain rocks, of Cretaceous and Tertiary Age, made up of igneous rocks and clays, mantled by gravels and crystalline limestone; the white limestones of Tertiary Age; recent alluvial formations; and the coast limestone of elevated reef rock. No recent volcanic rocks are known." For the Antillean mountain system, compare CARIBBEAN SEA and CENTRAL AMERICA. It is customary to say that the mineral resources of the republic have been either neglected or exhausted; and it is, indeed, quite certain that, whereas the Spaniards obtained large amounts of gold and silver, especially the former, from the mines that were worked during the early years of colonization, recent reports made by American experts are not especially favorable with regard to these two metals. The fact, however, seems to be that gold exists quite generally, but not in paying quantities if we allow for high-priced labor. The profits of the old mines were won by the labor of native and African slaves. Copper, iron, manganese, platinum, tin, marble, antimony, and chalcedony are found; and the analogy of the Santiago de Cuba mining region would suggest that the deposits of the first three metals deserve particular attention. Valuable petroleum lands have been found near Azua.

Soils and Climate.— The diversities of both soil and climate are greater than elsewhere in the Antilles. Thus, the Vega Real is fertile and well-watered; the Santiago plain, its western prolongation, is a desert. The soil of the western part of the plain of Seylo is gravelly, while that of the eastern part is composed of loams and clays. The country immediately surrounding Azua is barren; but the best sugar estates on the island are only three miles away — and the sugar-lands of no other West Indian island can quite rival in fertility San Domingo's best. The heat in low-lying and sheltered districts is intense: "fatal to Europeans," says an eminent Spanish authority. At an elevation of more than 1,600 feet, the nights are cold. Coasts and plains of a moderate elevation which have the benefit of the east wind are regarded as comparatively healthful: the capital, for example, where the temperature averages 64° F. in the morning and 85° F. at noon. The climate of Santiago de los Caballeros is fairly salubrious. The arid regions are chiefly the lower slopes on the windward side of the island; in the high mountains the precipitation of moisture is excessive. The rainy season culminates in May and June.

Forests, Flora, and Fauna.—Cedar, lignum vitæ, mahogany, and other cabinet-woods, as well as timber used in house- and ship-building, are taken from the forests, which also produce logwood, fustic, etc. (see list of exports); the most luxuriant growths, however, have no present commercial importance, because adequate means do not exist for bringing them from the interior regions to the coast. As in other parts of the Antilles, the forms of vege-

table life are varied and of special interest, while precisely the reverse is true of the fauna. See SANTO DOMINGO, ISLAND OF.

Agriculture.— In the south and west are the principal sugar plantations; the area of tobacco is the north and some parts of the uplands of the interior; coffee grows readily in the mountain regions, and in the district of Barahona its production on a large scale has begun; the cultivation of cocoa, like that of sugarcane, has increased rapidly since about 1885; cattle raising also receives a little more attention than formerly was the case; tropical fruits, especially bananas, flourish nearly everywhere.

Exports and Imports.—An official résumé of the exports through the custom-houses of the republic during the first half of 1902 shows the values of the principal articles of export to have been as follows: — sugar $1,962,814.18; cacao $750,530.32; coffee $188,500.00; bananas $37,836.50; wax $34,036.49; leaf tobacco $26,974.07; goatskins $22,051.56; ox-hides $20,313.04; campeche wood $10,730.00; mahogany logs $8,217.52; guayacán $7,078.32; honey $5,056.00; divi-divi $4,176.00; espinillo wood $2,701.45; live animals $2,691.00; bera $1,971.50; mahogany forks $1,570.00; sisal rope $1,419.40; and, less than $1,000 each: raw cotton, deer horns, yarey fibre, caya wood, cedar, tortoise shells, moss, molasses, mora wood, rum, and sole leather. The total value of exports in 1901 was $5,190,036.64. Of imports, the total value in ordinary years is somewhat more than one half that of exports, the large items being cotton goods, hardware, and provisions.

Railways, etc.— Besides the railway referred to above, which crosses two mountain ranges and connects Santiago with Puerto Plata, another line to furnish transportation from Samaná Bay to Santiago has been built to a point beyond La Vega. There are 430 miles of telegraph, and 51 post-offices. The difficulties of communication between the various districts of the country, primarily due to the cordilleras, are in part attributable to the government's neglect to build good highways — without which peace will never be assured. Several concessions for railways were granted in 1901. The republic has regular communication with America and Europe by means of the lines of steamships calling at its ports.

Government.— The constitution vests the executive power in a president chosen by an electoral college for a four years' term only; both he and the vice-president, however, are eligible for immediate re-election. The congress (a single house) is composed of two members from each province and maritime district, elected by direct popular vote with restricted suffrage. The cabinet in 1902 included the following secretaries: of interior and police; of war and marine; of foreign affairs; of justice and public instruction; of public works; of finance and commerce; and of posts and telegraphs.

Finances.— The customs revenue fluctuates a good deal. Thus, in 1896 it was $1,545,450; but $2,392,052 in 1900; while the customs receipts for 1901 amounted only to 1,876,145 *pesos*, according to the report of the Belgian consul at San Domingo city; and again the United States minister to the republic shows that the receipts from the several ports during November 1902 were $87,000, or less than one half as much as in November 1901. The export tax on sugar was repealed 1 March 1902; otherwise duties are levied on both imports and exports. The public debt amounted to $13,589,750 before 1898. In 1901 the foreign debt amounted to about $21,000,000 and the internal debt to $2,845,550 gold and $10,126,629 silver. The San Domingo Improvement Company, of New York, was entrusted with the collection of the customs duties 1 March 1893.

Army and Navy.—A regiment of soldiers is usually stationed in each province, and these, with the reserve corps, constitute the army. The government has three small gunboats.

Population.— The number of inhabitants in 1888 was, on high Spanish authority, 417,000, but according to an official estimate 610,000. No recent enumeration is trustworthy. The Despoblado region — the nearly uninhabited district of high mountains, inaccessible valleys, and virgin tropical forests — comprises, roughly speaking, the central third of the entire area of the island, or one half of the Dominican republic: it is the wide border-land fought over by the Haitians and the San Domingoans. The latter, of blended Spanish, Indian, and negro blood — with the small proportion of white descendants of the Spanish colonists and foreign merchants — occupy a restricted area, and, it is thought, scarcely number 600,000. Spanish is the language most in use.

Education, Religion, Judiciary.— Free primary instruction is offered by the communes, with the aid of the central government; the system including also superior technical and normal schools, and a professional school or university. There are about 40 newspapers. The state religion is the Roman Catholic. Religious toleration under "certain restrictions" is assured by the government's present policy of encouraging immigration. There are, beside the supreme court, 11 district tribunals and the municipal courts.

History.— Columbus, on his first voyage to America visited the north coast of the island and left a few of his men. These were killed by the natives; but the colony of Isabela, established on his second voyage, endured until the colonists were transferred to a more healthful locality. His settlement on the south coast, near the present city of San Domingo, was made during his third voyage — that of 1498. Spanish settlements existed also at Concepcion de la Vega, Puerto Plata, Santiago de los Caballeros, and Bonao in the first decade of the 16th century. The cultivation of sugarcane began in 1506. Three years later Christopher and Bartholomew Columbus were imprisoned by Bobadilla in the citadel of San Domingo. The natives were set to work in the mines and fields; and very soon shiploads of Indians were being transported from other islands to replace those who died under the hardships of this forced labor (see BAHAMAS). Negroes were brought from Africa for the same purpose, a considerable number of black slaves reaching the colony before 1522. There was a short period of prosperity; before the middle of the century, however, the most enterprising colonists were drawn away by the superior attractions of Mexico and Peru, and the country began to suffer from the attacks of English and French buccaneers, who established their headquarters on a small island near the northwest corner of

Haiti. In the course of a century and a half the section west of the Despoblado, and now known as the republic of Haiti, was won for France. The Spanish government at the close of the 18th century abandoned the eastern section as well, the entire island passing, first, under French control; but soon afterward the successes of Toussaint L'Ouverture and Dessalines (q.v.) united west and east in one country, independent of the European powers and governed by the black revolutionists of Haiti. Between 1809 and 1821 Spain again held the eastern section, and the old name Santo Domingo was revived with that limited application; but in the year last mentioned the San Domingoans revolted. Many of the Spanish families withdrew permanently from the island. San Domingo and Haiti were united from 1822 to 1843, together forming the republic of Haiti. The final separation took place in 1844, when the Dominican republic was established. Spain reasserted her authority once more for a brief period (1861–5); with that exception the many struggles through which the country has passed since 1844 have been due either to revolutions or to Haitian antipathy. In 1869 a treaty for the annexation of the Dominican republic to the United States was negotiated, during Gen. Grant's presidency, but was defeated in the United States Senate. A revolution which drove President Baez into exile expressed the resentment of the San Domingoans when this failure was made known. Comparatively good order was maintained for a few years, beginning in 1890, but the most violent methods were resumed by political leaders in 1898–9, and continued in 1902–3. President Jimenez was forced by a revolutionary uprising to resign his office in May 1902. His successor, Vasquez, was driven from power early in May 1903, after severe fighting, attended with heavy losses.

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MARRION WILCOX.

Domin'icans, or Friars Preachers, or Preaching Friars (*Fratres Prædicantes*), the religious order founded by St. Dominic. While laboring in Provence for the conversion of the Albigenses, Dominic associated to himself 16 disciples eager, like himself, to devote their lives to the work of reclaiming heretics and ministering to the spiritual needs of the poor and ignorant. In 1215 he visited Rome to obtain from the Holy See approval of the institute he proposed to form. Of the 16, 8 were French, 6 Spanish, 1 Portuguese, and 1 English. The Pope (Innocent III.), in conformity with the decree of the Lateran Council, then in session, against approval of new religious orders, refused again and again his consent, but at last promised to give his approbation on the condition that the friars should adopt as their own the monastic rule of the Augustinians. The condition having been fulfilled, the order was formally approved in 1216 by Innocent's successor, Honorius III. The costume of the friars was to resemble that of the Augustinians, and to consist chiefly of a black cassock and rochet; but a few years afterward this was changed for the white habit and scapulary with outside black mantle, which is still the costume of the Dominicans. Their name Black Friars was given them because of the black mantle worn out of doors. The memory of their great monastery in London is preserved in the name Blackfriars Bridge. Houses of the new order were immediately founded in France, the Rhineland, and Italy; and in 1221 was held the first general chapter of the order at Bologna in which were represented 60 convents of preaching friars. That same year arrived in England the first band of Dominicans, 12 of the brothers in charge of Gilbert de Fremey. At this chapter an addition was made to the rule of the order, by which the Dominicans were forbidden to hold any possessions or have any fixed incomes; but to live by the voluntary alms of the people: thus the Friars Preachers became mendicant friars like the Franciscans. All the universities were opened to the young scholastics of the order, and soon many preaching friars attained the foremost rank as philosophers, divines, canonists and scholars. Among divines and philosophers the Dominicans Albert the Great and Thomas Aquinas hold the highest places; the celebrated German mystics and divines Meister Eckhart, John Tauler, and Henry Suso were Dominicans. The great mediæval encyclopædic work, *Speculum Majus*, was the work of a Dominican, Vincent of Beauvais. The highest places in the Church have been occupied by Dominicans; since the order was founded there have been 3 Dominicans popes, 60 cardinals, 150 archbishops, and more than 800 bishops. A second and a third order were also founded by St. Dominic, the second order being for women, and the third for men and women living in the world, engaged in secular pursuits and married. (See TERTIARIES). The Dominican houses suppressed in England by Henry VIII. numbered 58.

Dominie Sampson, the schoolmaster in Sir Walter Scott's 'Guy Mannering.'

Dominion of Canada. See CANADA.

Dominique. See DOMINICA.

Dominis, Marco Antonio de, mär'kō ān-tō'nē-ō dā dōm'ē-nēs, Italian theologian and ecclesiastic; b. Arbe, an island in the Adriatic, 1566; d. Rome 28 Sept. 1624. He studied in the college of the Jesuits at Loretto and in the University of Padua, and was made bishop of Segni 1596, and archbishop of Spalatro or Spalato 1602. Here he projected schemes for the reformation of the Church and unification of Christendom, but came into disfavor at the Roman court and had to quit, take refuge at Venice, where he made the acquaintance of Bedell, chaplain of the English embassy, afterward bishop of Kilmore in Ireland. De Dominis accompanied Bedell to England and through his influence obtained from King James the deanery of Windsor and other places in the Established Church. He was zealous for the overthrow of

the papal system and published in London (1670) a work in Latin, 'De Republica Ecclesiastica,' designed to prove that the Pope possesses in the Church only a primacy of honor not of jurisdiction. In 1619 was published his translation into English of Fra Paolo Sarpi's 'History of the Council of Trent.' He returned to Rome 1622, at the instance of the Spanish ambassador at London, who led him to believe that he would be welcome there and would be raised to the cardinalate. He published a recantation of his subscription to the Anglican articles of religion, but his hopes of honors at Rome were disappointed, and in letters to his friends in England he recanted his recantation: but the letters never reached their destination, having been seized by the papal officers. He was thrown into prison by order of Urban VIII. and there died 1624. After his death he was adjudged a heretic: his body was disinterred and burned, and the ashes thrown into the Tiber. In 1611 was published his tract, 'De radiis visus et luces in vitris perspectivis et iride' ('Of the Rays of Vision and Light in Perspective Glasses and the Rainbow'), in which is probably for the first time proposed the true theory of the rainbow.

Domin'ium (Lat. *dominus*, a master), in Roman law, the right by which any one exercised control over property, and by which he was entitled to retain or alienate it at pleasure, as opposed to a mere life interest, or possessory or equitable right. *Dominium directum*, in feudal law, is the interest or superiority vested in the superior; and *dominium utile* is the interest in property vested in the vassal, which amounts to the right of merely using it (see SERVITUDES, USUFRUCT) as distinguished from that of his lord's ownership and supremacy.

Domino. See MASK.

Domino Whist. See FIVE OR NINE.

Dominoes, a game played with small flat rectangular pieces of ivory, about twice as long as they are broad. They are marked with spots varying in number. Each domino has two sets of spots ranging in number from 0 up to 12, which are distributed in all possible combinations — 0–0, 0–1, 0–2, 0–3, etc., to 0–12; then 1–1, 1–2, 2–3, 2–4, and so on up to 12–12. Those which have the two sets of spots alike — 2–2, 3–3, etc., are called double twos, double threes, etc. The game is to appearance remarkably simple, but is played in a variety of ways. The general principle of all the varieties is that when one player leads by laying down a domino, the next must follow by placing alongside of it another which has the same number of spots on one of its sides. Thus if the first player lays down 6–4, the second may reply with 4–8, or 6–7, etc.; in the former case he must turn in the 4, placing it beside the 4 of the first domino, so that the numbers remaining out will be 6–8; in the latter case he must turn in the 6 to the 6 in like manner, leaving 4–7, to which his opponent must now respond. The player who cannot follow suit loses his turn; and as the object of the game, modified by special conditions in the different varieties, is to get rid of all the dominoes in hand, or to hold fewer spots than your opponent when the game is exhausted by neither being able to play, it is a special point of play to shut out your opponent when it can be done without injury to your own hand.

Dom'inus, the Latin word which we commonly render by "lord," but which more properly signifies the master of a house, and his eldest son, as opposed to slave (*servus*). The Scottish "dominie," in the sense of schoolmaster, is of course taken from it, as is the same term in America, where in some places it is the title of a minister of the Dutch Reformed Church, and in others is applied to Protestant clergymen generally.

Domitia, dō-mĭsh'ĭ-ą, Roman empress: b. Gaul about 56 A.D.; d. Rome about 100 A.D. She was the daughter of Domitius Corbulo, a general of Nero's reign. She was married first to Ælius Lamia, but the Emperor Domitian took her for his wife. Finding that her new husband intended to have her executed she caused his assassination in 96 A.D. Her subsequent career is uncertain.

Domi'tian, Titus Flavius Domitianus Augustus, Roman emperor: b. Rome 24 Oct. 51 A.D.; d. there 18 Sept. 96 A.D. He was a son of Vespasian, and brother of Titus, and made himself odious, even in youth, by his indolence and voluptuousness, and his cruel, malignant, and suspicious temper. He became emperor 81 A.D. At first, indeed, he deceived the people by acts of kindness, good laws, and a show of justice, so that their fears vanished; but he soon returned to his former excesses and cruelty. Agricola's victories exciting his jealousy, he recalled that general to Rome, and kept him in total inactivity. At the same time he spread terror through Rome by the execution of a great number of the first citizens. He gave himself up to every excess, and to the meanest avarice. He at last conceived the mad idea of arrogating divine honors to himself, assumed the titles of Lord and God, and claimed to be a son of Minerva. His principal amusement consisted in the shows of the circus. The misery of the people was, meanwhile, continually increasing; and after the revival of the law against high treason, which enabled almost anything to be construed into this crime, no one was secure of his property or his life. A paper fell into the hands of his wife, Domitia, in which she found her own name, and those of the two commanders of the prætorian guards, with many others, noted down by the emperor as victims. This discovery induced her to conspire against him, and he was killed by a freedman named Stephanus.

Domremy-la-Pucelle, dôn-rā-mē-lä-pü-sĕl (original, Domremy; La Pucelle, that is, The Maid, has been added in honor of Joan of Arc), a small village in the department of the Vosges, in France, not far from Vaucouleurs, in the department of the Meuse. It is noted for being the birthplace of Joan of Arc. The village contains a bronze statue of the heroine, and another monument to her, and the cottage in which she was born still stands. A chapel on a neighboring hill marks the spot where she is said to have learned of her great mission. There is here also a museum. Domremy was exempted from taxation till the Revolution, in honor of the warrior-maiden.

Don (Lat. *dominus*), a Spanish title of honor, originally given only to the highest nobility, afterward to all the nobles, and finally used indiscriminately as a title of courtesy. It corresponds with the Portuguese Dom. During the Spanish occupation it was introduced

and became naturalized in some parts of Italy, particularly in Naples.

Don Carlos. See CARLOS.

Don César de Bazan, dŏn sā-zār dŭ bā-zan, the title of a French comedy founded on a portion of Hugo's play, 'Ruy Blas.' Don César is a ruined nobleman who changes his name, and in rags conducts himself with the happy, devil-may-care nonchalance of his better days.

Don Gerard, Dutch painter. See DOW, GERARD.

Don Giovanni, dŏn jō-vän'nē (Italian form of Don Juan, the name of the hero), the title of an opera by Mozart, considered his masterpiece, produced at Prague 29 April 1787.

Don Juan, dŏn jū'an, Sp. dōn hoo-än', the hero of a Spanish legend which seems to have had some historical basis in the history of a member of the noble family of Tenorio at Seville. According to the legend Don Juan was a libertine of the most reckless character. An attempt to seduce the daughter of the governor of Seville brought the indignant father and the profligate don into deadly conflict, in which the former was slain. Don Juan afterward, in a spirit of wild mockery, goes to the grave of the murdered man and invites the statue of him erected there to a revel. To the terror of Don Juan the "stony guest" actually appears at the table to bear him away to the infernal world. The tale has furnished the subject for many dramas and operas. The most famous of the latter is Mozart's 'Don Giovanni' (q.v.). Among the former are: 'Burlador de Sevilla' by Tellez; 'Don Juan ou Le Festin de Pierre,' by Molière; and 'The Libertine,' by Shadwell. The 'Don Juan' of Byron's poem bears no relation to the Don Juan of legend, save the name and libertine character of the hero.

Don Orsino, a novel by Francis Marion Crawford, published in 1892. The author's purpose is to describe a young man of the transition period in Rome after the unification of Italy. He chooses for his hero Orsino Saracinesca.

Don Pasquale, dŏn päs-kwä'lā, an opera by Donizetti, produced 4 Jan. 1843 in Paris. It is considered one of the composer's best, although it never had a place in public estimation, such as was given to 'Lucie'; 'La Favorita'; 'La Figlia del Reggimento'; and others.

Don Quixote, dŏn kwiks'ŏt, Sp. dōn kē-hō'tā, a novel by Cervantes, in two parts, the first of which appeared at Madrid in 1605 and the second in 1615. The hero is a country gentleman who under the influence of the many romances he has read sets forth in search of adventures, accompanied by his squire, Sancho Panza (q.v.). From the hero's name is derived the word quixotic. For the author's aim in writing this book, see CERVANTES.

Don, or **Dun,** a river of Yorkshire, England, which rises near Cheshire, flows east and southeast and joins the Ouse after a course of about 55 miles. By artificial cuttings and canals it has been rendered navigable for vessels of 50 tons, to Sheffield, a distance of about 40 miles.

Don (ancient TANAIS), a river of Russia, which issues from Lake Ivan-Ozero, in the government of Tula, and flows southeast and southwest about 1,200 miles into the Sea of Azof, near the town of Azof, by three mouths, only one of which is navigable. The delta of the Don is an expanse of sandy flats, about 28 by 22 miles at the coast-line. Near its head is the important river-port of Rostov, and Taganrog also shares in the Don traffic. The Don has the most busy trade of all the rivers of south Russia. The navigation is generally stopped by ice for about three months of the year; nevertheless, by means of its lower course, in connection with the Volga, the south provinces of Russia receive much Siberian produce, and also manufactured goods from the interior of the empire.

Don, a river in the county of Aberdeen, Scotland. Its source is several small streams flowing from a bog about 1,000 feet above the sea. It flows east into the North Sea. It is about 75 miles in length. Its salmon fisheries are of considerable value.

Do'na Francis'ca, Brazil, a German colony in the state of Santa Catharina, lying between the Serra do Mar and the Atlantic Ocean, 14 miles inland from the port of São Francisco. Area, 97 square miles; pop. (1903) 21,000. Chief town, Joinville, with 2,700 inhabitants.

Donald, Elijah Winchester, American Episcopal clergyman: b. Andover, Mass., 31 July 1848. He was graduated from Amherst College, in 1869, entered the Episcopal ministry and has been rector of Trinity Church, Boston, from 1892. He has published 'The Expansion of Religion.'

Donaldson, Edward, American naval officer: b. Baltimore 17 Nov. 1816; d. 15 May 1889. He entered the navy in 1835; and in the Civil War took part in the attack on forts Jackson and St. Philip, in the passage of Vicksburg, and in the battle of Mobile Bay. He retired from active service in 1870.

Donaldson, James Lowry, American soldier: b. Baltimore 17 March 1814; d. there 4 Nov. 1885. He was graduated from West Point and entered the army in 1836. He fought in the Florida war, in the Mexican War, and in the Civil War. At the close of the latter he received the rank of major-general in the United States army. He wrote 'Sergeant Atkins' (1871), a story of the Florida war.

Donaldson, Thomas Leverton, English architect: b. London 10 Oct. 1795; d. there 1 Aug. 1885. He was professor of architecture at University College, London, 1841–65, and emeritus professor there for the rest of his career. He published 'Pompeii' (1827); 'A Collection of the Most Approved Examples of Doorways from Ancient Buildings in Greece and Italy' (1833), etc. Among buildings designed by him are University Hall, Gordon Square, London, and the Scottish Corporation Hall.

Donaldson, Washington H., American aëronaut: b. Philadelphia, Pa., 1840. In early life he was by turns a gymnast, a ventriloquist, a conjurer, and a tight-rope walker. A hotel proprietor presented him with a balloon, whereupon he became an aëronaut, and made himself famous all over the United States by his daring and reckless ascensions. On 15 July 1875, he made an ascension from the lake front in Chi

cago and neither Donaldson nor his balloon was ever seen thereafter.

Donaldsonville, La., town, county-seat of Ascension Parish; on the Mississippi River, and the Texas & P. R.R.; about 30 miles in an air line south of Baton Rouge. It is the trade centre of a cotton, rice and sugar-growing county. Pop. (1900) 4,105.

Donatello, dōn-ä-tĕl'lō (properly, DONATO DI BETTO BARDI), a famous sculptor: b. Florence about 1386; d. Florence 1466. His family had several distinguished literati among its members, and repeatedly, from the middle of the 16th century, had given a doge to Venice. His first great works in marble were statues of St. Peter and St. Mark, in the Church of Or San Michele in his native city. His own favorite piece was the statue of an old man in senator's dress placed on the Campanile, and known by the name of Il Zuccone, or The Bald-Head. For the Church of St. John he executed a Penitent Magdalen in wood; but in this branch of art he was surpassed by his friend, Brunelleschi, with whom he made a journey to Rome to acquaint himself with its treasures. After his return to Florence he executed for his patrons, Cosmo and Lorenzo de Medici, a marble monument to their father and mother, which excited universal admiration. One of the principal ornaments of the Church of Or San Michele, is a marble statue of St. George, surpassed by no similar statue which has since been erected. This statue was ordered by the Guild of Armorers (1416). Among his other leading works are a St. John the Baptist, in the Bragello; Judith and Holofernes, in the Loggia dei Lanzi; David, in the Museum, Florence; St. Cecilia, in profile, owned by Lord Elcho, in England. Notwithstanding his strictness he was honored as a father by all his scholars, among whom were Desiderio da Settignano, Benedetto di Majano, and Nanni d'Antonio. Consult: Radcliffe, 'Schools and Masters of Sculptors'; Perkins, 'Handbook of Italian Sculpture'; Clement, 'Sculpture'; and Vasari.

Donati, Giovanni Battista, jō-vän'nē bät-tēs'tä dō-nä'tē, Italian astronomer: b. Pisa 16 Dec. 1826; d. Florence, 19 Sept. 1873. He was appointed in 1852 assistant at the observatory in Florence, of which he became director in 1864. Here he discovered, *inter alia*, the brilliant comet of 1858, which is known as Donati's comet. He afterward was instrumental in erecting the fine observatory at Arcetri, near Florence, and constructed a spectroscope of 25 prisms.

Donation Lands are lands donated by Congress to actual settlers, out of the public domain. On 4 Aug. 1842, the lands in east Florida were thrown open to public settlement, by the grant of a quarter-section (160 acres) to every able-bodied adult. On 27 Sept. 1850, a similar act was passed for Oregon, granting from a quarter-section to a full section according to conditions. Later acts provided for rights of reversion on these. Donations of land for coast defenses, from private individuals to the government, are provided for by law.

Don'atists, a heretical sect in the 3rd century, and till the Vandal invasion a formidable opponent of the Roman Catholic Church in the Mediterranean provinces of Africa. The sect arose out of dissensions at Carthage over the question of the readmission to church fellowship of those persons who in Diocletian's persecution had denied the faith either explicitly or implicitly, by giving up to the persecutors the Christian sacred books. On that point they were extreme rigorists, as also in holding that a priest or deacon could not validly administer baptism if he were himself in a state of sin. When Mansurius was consecrated bishop of Carthage, the faction, headed by one Donatus repudiated him as a *traditor*, one who had given up the sacred books; and when after his death (311), Cæcilian became bishop of Carthage, 70 Numidian bishops refused to have communion with him, as one that was consecrated by a *traditor*. They set up a rival bishop, Majorinus, and the schism grew steadily wider, being specially favored by the peasants. The schismatics were condemned by Melchiades, the reigning Pope, with three bishops of Gaul, in 313. This judgment was confirmed the next year by the council of Arles, and in 316 by the council of Milan, convoked under the protection of the emperor Constantine; but the Donatists paid no heed, and in 330 a council was held by 270 Donatist bishops who denounced their opponents as heretics. The peace not only of the Church but of the civil state was seriously compromised by uprisings of the fanatical multitude against the Roman Catholics throughout northern Africa, to repress which the severe laws enacted by the emperors were ineffective. St. Augustine, bishop of Hippo from 400 to his death in 430, labored zealously to restore peace to the Church. In 411 he held a conference with 279 of their bishops at Carthage. The sect early began to split up into independent smaller sects, and they disappeared from the page of history after the Vandal invasion in 429.

Donatus, dō-nā'tŭs, **Ælius**, Roman grammarian and commentator who lived in the 4th century. He wrote an elementary work on the Latin language, 'De octo partibus orationis,' which served as a guide to the learning of Latin in the Middle Ages, and formed the groundwork of most elementary treatises until recent times. It was one of the books most frequently printed at the commencement of the art, several editions having been issued from blocks even before the invention of types.

Donau, dō'now. See DANUBE.

Donauwörth, dō'now-vĕrt, Germany, a walled town of Bavaria, at the junction of the Wörnitz and Danube, about 25 miles north by west of Augsburg. The monthly live stock market is a source of wealth to the town. Pop. 4,083.

Don'caster, England, a municipal borough in the West Riding of Yorkshire on the Don. It has long been famous for its annual races, begun in 1703. Nearby are the ruins of Conisborough Castle, the stronghold of Athelstan in Scott's 'Ivanhoe.' Pop. (1900) 25,000.

Dondo, dŏn'dō, West Africa, a town of Angola situated at the head of navigation on the Coanza River, and not far from the Loanda Railway. It has a considerable caravan trade and is an import coffee market. Pop. 3,000.

Dondrah (dŏn'dra) or **Dondera Head**, the southern extremity of the island of Ceylon, a steep and rugged promontory, formerly the site of a temple.

Donegal, dŏn'e-gal, county in the province of Ulster, Ireland; area, 1,100,200. About one half is good farming land, but the mountainous districts are rich in minerals. Pearl-mussels abound in the rivers. Pop. 185,635.

Don'elson, Andrew Jackson, American diplomatist; b. near Nashville, Tenn., 25 Aug. 1800; d. Memphis, Tenn., 26 June 1871. He was graduated at the United States Military Academy in 1820, and entered the army as a lieutenant of engineers. In 1822 he resigned, studied law, and also engaged in cotton raising in his native State. He filled a number of responsible offices; was private secretary to President Jackson in 1829–30; minister plenipotentiary to Prussia, and later to Germany, in 1846–9; was editor of the Washington *Union* in 1851–2; was candidate of the American party for Vice-President in 1856; and after his defeat retired to private life.

Donetz, dō-nyĕts', or **Severnoi Donetz,** a river in Russia which, rising in the government of Kursk, flows almost due south about 400 miles into the Don.

Don'gan, Thomas, Earl of Limerick, English colonial official; b. Castleton, Ireland, 1634; d. London, 14 Dec. 1715. After serving in the British and French armies he was appointed colonial governor of New York by the Duke of York in 1682. He gave the city of New York its first charter in 1686 and being accused of ignoring his pacific instructions regarding the French and Indians, and of inciting the Five Nations to war, resigned his commission in 1688, returned to England in 1691, succeeding to the earldom of Limerick in 1698.

Dongola, dŏng'gō-lā, a province of Nubia, in Africa. The chief town of this district is of the same name. Pop. about 6,000.

Dongola Kid. See Leather.

Don'iphan, Alexander William, American military officer; b. Mason County, Ky., 9 July 1808; d. Richmond, Mo., 8 Aug. 1887. He began the practice of law in 1830 in Lexington, Mo. He was three times elected to the Missouri legislature. He served in the Mexican war, in which he made a brilliant record, capturing Chihuahua after an unexpected encounter with an army of 4,000 men. He was one of the peace commissioners at the convention which met at Washington previous to the Civil War.

Donizetti, Gaetano, gä-ā-tä'nō dō-nē-dzĕt'-tē, Italian composer; b. Bergamo 25 Nov. 1797; d. there 8 April 1848. He studied music at Bologna under the distinguished Abbé Mattei. His first opera, 'Enrico di Borgogna,' was represented at Venice in 1818. In 1822 his 'Zoraïde di Granata' gained him the honor of being crowned on the capitol. In 1830 appeared his 'Anna Bolena,' which first, with 'Lucrezia Borgia' and 'Lucia di Lammermoor,' the latter his masterpiece, acquired for him a European fame. In 1835 Donizetti was appointed professor of counterpoint at the Royal College of Naples, but removed in 1840 to Paris, bringing with him three new operas, 'Les Martyrs,' 'La Favorita,' and 'La Fille du Régiment,' of which the last two are among his most popular productions. Of his other operas none except 'Linda di Chamouni' (1842) and 'Don Pasquale' (1843) achieved any special triumph. See Ferris, 'Great Musical Composers' (1887).

Donjon, dŭn'jŭn or dŏn'jŏn (Lat. *dominus* lord, changed to mean master or lord over), the grand or principal or commanding tower or keep of a mediæval castle, frequently raised on an artificial elevation. It was the strongest portion of the building, usually detached from the surrounding buildings. The donjon contained the great hall and principal rooms of state for solemn occasions, and also the prison fortress; from the last is derived the word dungeon.

Donkey. See Ass.

Donkey Engine, a small auxiliary steam-engine in a ship, not used for propelling but to assist in performing various operations where no great power is required. Thus a donkey engine is often stationed on the deck of a ship to work a crane for loading and unloading.

Don'levy, Harriet Farley, American editor and author; b. Claremont, N. H., 18 Feb. 1817. She was educated as a teacher, but abandoned this pursuit and worked in cotton mills at Lowell. From 1840 to 1848 she edited a mill-girls' magazine, 'The Lowell Offering,' acting as contributor, editor and publisher of the 'New England Offering,' with which she was connected till 1850. She married John Intaglio Donlevy in 1854, who died 1872. Among her works are: 'Shells from the Strand of the Sea of Genius,' reprints from 'Lowell Offering' (1847); 'Happy Hours at Hazel Nook' (1852); 'Christmas Stories'; 'Mind Among the Spindles,' London (1849); also a reprint from the 'Lowell Offering.'

Donne, dŏn, **John,** D.D., English poet and divine; b. London 1573; d. there 31 March 1631. His parents were Roman Catholics, but in his 19th year he abjured that religion, and became secretary to the Lord-chancellor Egerton. He continued in that capacity five years, but finally lost his office by a clandestine marriage with his patron's niece. He subsequently took orders by the desire of King James, and was soon after made one of his chaplains. In 1621 he was appointed dean of St. Paul's. He was chosen prolocutor to the convocation in 1623–4; and, in consequence of a dangerous illness, soon after wrote a religious work, entitled 'Devotions upon Emergent Occasions.' As a poet, and the precursor of Cowley, Donne may be deemed the founder of what Dr. Johnson calls the metaphysical class of poets. Abounding in thought this school generally neglected versification, and that of Donne was peculiarly harsh and unmusical. He wrote Latin verse with much elegance. A collection of his Latin poems was published in 1633. Of his prose works, one of the most remarkable is that entitled, 'Biathanatos,' to prove that suicide is not necessarily sinful, which he never published himself, but which found its way to the press after his death. His style is quaint and pedantic; but he displays sound learning, deep thinking, and originality of manner. Besides the works already mentioned, he wrote the 'Pseudo-Martyr' (1610), letters, sermons, etc. See Gosse, 'Life and Letters of John Donne' (1899); Jessop, 'John Donne' (1897).

Don'nelly, Eleanor Cecilia, American author; b. Philadelphia, Pa., 6 Sept. 1838. She is a sister of Ignatius Donnelly (q.v.). Among her many volumes of verse are: 'Out of Sweet Solitude'; 'Domus Dei'; 'Legend of the Best

Beloved and Other Poems'; 'Crowned with Stars'; 'Hymn of the Sacred Heart'; 'Children of the Golden Sheaf and other Poems.' She has also written several prose works, including 'Life of Father Felix.'

Donnelly, Ignatius, American prose writer: b. Philadelphia, 3 Nov. 1831; d. Minneapolis, Minn., 2 Jan. 1901. He was prominent in Minnesota politics, but was best known as an author. Among his writings are: An 'Essay on the Sonnets of Shakespeare'; 'Atlantis, the Antediluvian World' (1882); and 'Ragnarök' (1883). In 'The Great Cryptogram' he endeavors to prove that Francis Bacon was the author of Shakespeare's plays. His best-known novel is 'Cæsar's Column.'

Donner, Georg Raphael, gā'ôrg rā'fä-ĕl dŏn'nĕr, Austrian sculptor: b. Essling, Austria, 25 May 1692; d. Vienna 15 Feb. 1741. He studied at the Vienna Academy of Architecture, and was employed at the imperial court, and also by Prince Esterhazy. Among his best works are the fountains on the Mehlmarkt, and at the city hall, Vienna, and a statue of Charles VI.

Don'nybrook, Ireland, a village now forming part of Pembroke township, in the county of and two miles southeast of Dublin. It is famous for its fairs, now abolished, which used to attract vast multitudes of persons, and seldom passed off without riot and bloodshed.

Donoghue, John, American sculptor: b. Chicago, Ill., 1857; d. New Haven, Conn., July 1903. He won a first prize over many competitors at the Chicago Fair for a classical group, 'Sophocles Leading the Chorus After the Battle of Salamis.' He designed the 'St. Paul' in the Congressional Library in Washington, the 'St. Louis of France' of the Appellate Division building in New York, and busts of Gov. Ames and John Boyle O'Reilly in the Boston Public Library. Other works were his 'Venus,' and 'Diana,' and best known of all, his 'Egyptian Ibis.'

Don't Worry Circles, associations formed in New York in the winter of 1897–8 from suggestions in 'Don't Worry: The Spiritual Law of Happiness,' published by Theodore F. Seward. The rules given for conquering the habit of worrying are based upon religious faith, common-sense and a spirit of helpfulness. For a time Washington was the centre of the movement.

Do'nus, Pope from 676 to 678. He is known as a patron of architecture, and adorned many of the churches of Rome; he also compelled the archbishop of Ravenna to recognize his authority. Sometimes a Donus II. is recorded as Pope for a short time in 974, but this is recognized as a mistake, due to an error of a copyist.

Doo, George Thomas, English line-engraver: b. Christ Church, Surrey, 6 Jan. 1800; d. Sutton, Surrey, 13 Nov. 1880. He made himself best known by his famous plates of 'Knox Preaching,' after Wilkie; of Eastlake's 'Italian Pilgrims Coming in Sight of Rome'; by his exquisitely finished heads of women and children, after Lawrence; and by his engravings from Raphael, Correggio, and others. His plate of the Calmady Children, titled 'Nature,' after Lawrence, produced in 1830, ranks as his masterpiece. In 1851 he was elected a Fellow of the Royal Society; in 1857 an academician. About 1853–5 he painted in oils, his works of this class being mainly portraits. In 1864 he completed, after eight years' work, a large engraving of the 'Raising of Lazarus,' by Sebastian del Piombo, his last important work.

Dooley, Mr. See DUNNE, FINLEY PETER.

Doolittle, Charles Camp, American soldier: b. Burlington, Vt., 16 March 1832. He entered the volunteer service during the Civil War, becoming colonel in 1862. He led a brigade at Nashville; and was commander of the northern district of Louisiana in 1865. In June, 1865, he was made major-general of volunteers, and was mustered out of service in November of the same year. He moved to Toledo, Ohio, where he was cashier of the Merchants' National Bank.

Doom, the old name for the "Last Judgment," a subject usually chosen for paintings over the chancel arch in parochial churches in England. Dooms were executed in distemper, and are of constant occurrence. In the reign of Edward VI. these representations were effaced, or washed over, as superstitious.

Doom Palm, or Doum Palm, a palm-tree, *Hyphæne thebaica,* whose branches terminate in a tuft of large fan-shaped leaves. The fruit is about the size of an apple; it has a fibrous mealy rind, which tastes like gingerbread (whence the name gingerbread-tree sometimes applied to this palm), and is eaten by the poorer inhabitants of Upper Egypt, where it grows. An infusion of the rind is also used as a cooling drink in fevers. The seed is horny, and is made into small ornaments. Ropes are made of the fibres of the leaf-stalks.

Doomsday or Domesday Book, the record of a statistical survey of England, made by royal authority in the reign of William the Conqueror. The origin of the name has been much disputed. Popularly it has often been associated with the final day of judgment. There was a doom-book or dom-boc (q.v.) composed in the reign of King Alfred, which contained a collection of the laws and customs of the kingdom; and the doomsday book is conjectured to have taken its name from the fact of its containing the authoritative data on which legal decisions in regard to land and other collateral property were to be given. The general survey of the kingdom was ordered at Christmas 1085, and completed in the following year. It was made by commissioners appointed by the king, who collected the particulars at inquests from a sworn jury, consisting of sheriffs, lords of manors, presbyters, bailiffs, villains; all the classes, in short, interested in the matter. The information collected consisted in specifications of the extent of land in each district, their proprietors, tenure, and value; the state of culture, namely, the quantity of meadow, pasture, wood, and arable land; in some counties the number of tenants, villains, *cotarii* and *servi;* even the sheep and cattle on the different estates were taken, but these were not entered in the permanent record. Northumberland and Durham were omitted, and the northern part of Cumberland and of Westmoreland. The original 'Domesday Book' is preserved in the record office. It consists of

two volumes; one folio, one quarto. The republication of this valuable record was undertaken in 1707 and completed in 1783. Perfect facsimiles of the whole book in photozincography have also been made.

Doon, a river in Ayrshire, Scotland, which after a course of 30 miles flows into the Firth of Clyde. It is celebrated in the poems of Burns.

Door, a wooden or metal, sometimes stone frame or panel constructed to open and shut on hinges; used for entrances to buildings, rooms, etc. Sometimes made of one piece, but generally of several sections framed together. The doors of ancient Egypt and kindred countries swung upon vertical pintles which projected from the top and bottom of the door into sockets above and below. In China and other eastern countries doors may be seen today swinging on pivots. In modern carpentry, doors are classified under two general heads: batten-doors and panel-doors. The former are made of two or more boards placed longitudinally and held together by transverse rails. The latter are formed of a skeleton frame work into which is fitted lengths of thin board called panels. Folding and sliding doors have been improvements upon the hinge variety, working on tracks or grooves and having the particular value of economizing space.

Door'ga, in Hindu mythology the principal wife of Siva, one of the gods belonging to the Hindu triad. In Bengal the name Doorga is her appropriate appellation, and was given her by transference from the giant Doorga whom she slew. In southern and western India she is called Purwutee, or Parvati.

Doorn, a common name in South Africa. It indicates various communes in the Cape Colony. It also designates two rivers, in Africa, distinguished as Great and Little Doorn.

Doorn'boom (*Acacia horrida*), a tree common in South Africa. The name "thorn-tree," given to it by the Dutch colonists, and the botanical specific name, are due to the number and sharpness of its spines. It seldom much exceeds 30 feet in height, but its timber is hard and tough, and is much used for house-carpentry, etc. See ACACIA.

Dope (from Dutch *doop*, sauce) is a descriptive term meaning any thick liquid like molasses; a thick sauce or gruel or other viscous fluid or pasty thing used for eating is called a dope. Also a thick pasty lubricant like axle-grease. Fillers used in painting to fill the pores of the wood and prevent the absorption of the paint or varnish subsequently applied to the wood. A preparation of pitch, tallow and other ingredients which, when applied to the bottoms of shoes, will enable the wearer to lightly glide over softened snow. Any absorbent material, as cotton-waste for holding axle-grease or kieselguhr for holding nitro-glycerine. A stupefying substance like opium or chloral hydrate. For dynamite dopes see EXPLOSIVES.

Dop'pler, Christian, Austrian mathematician and physicist: b. Salzburg, Austria, 30 Nov. 1803; d. 17 March 1853. He was professor of mathematics at Prague 1841–7, and at Vienna held a similar post in the Polytechnikum 1848–51. For the last two years of his life he was director of the physical institute at Vienna University. He published: 'Ueber das farbige Licht der Doppelsterne' (1842); 'Versuch einer systematischen Klassification der Farben' (1848); etc., and made known the noted "Doppler's Principle" (q.v.).

Doppler's Principle, a name given to the physical law (first enunciated in 1842 by Christian Doppler of Prague,) that the apparent wave-length of sound or light depends upon the velocities of the observer and of the source from which the radiation proceeds. For the sake of illustration, let the source of the radiation be stationary with respect to the medium that transmits the waves, and let the velocity of the waves in this medium be V. If N is the number of waves of a certain definite wave-length that the source emits every second, then the observer will also receive N of these waves every second, provided he remains stationary. If the observer is moving, however, the case is different. For example, suppose that he is receding from the source of the radiation with a uniform velocity v, and consider what happens in the course of a single second. During this second N waves reach his initial position, just as before; but at the end of the second he is v units of distance beyond that initial position, and hence it is impossible that all of these N waves can have reached him. The deficit will evidently be equal to the number of waves whose combined lengths would just measure v. But the source sends out N waves every second, and when the last of these N is just leaving the source, the first one of the series has proceeded to a distance V. Hence we know that the length of one wave is $\frac{V}{N}$; and to find the number of waves that would be required to fill the distance v, we have only to divide v by the length of a single wave; that is, we have to divide it by $\frac{V}{N}$. Hence the observer's motion will diminish the number of waves that reach him every second by $\frac{Nv}{V}$, and, therefore, when he is receding from the source with the velocity v, he will receive only $N - \frac{Nv}{V}$, or $\frac{N(V-v)}{V}$, waves per second. The result will be, that the wave-length of the sound (or light) will appear to him to be longer than it really is. The same line of reasoning will show that if the observer is stationary and the source is receding with a velocity v, the number of waves that the observer will receive per second will be $\frac{NV}{V+v}$. If the motion is such as to diminish the distance instead of increasing it, the algebraic sign of v must be reversed in the foregoing formulæ. The most familiar example of Doppler's principle is afforded by the sudden change in the apparent pitch of a sounding bell or whistle on an express train moving at high speed. If the observer stands close to the track, the pitch falls suddenly and very markedly, as the locomotive passes him. The most important applications of the principle, however, are in astronomy, in connection with the mea-

surement of the velocities of the celestial bodies, by observing the displacement that their motion produces in the positions of the lines of their spectra. (See SPECTROSCOPE.) If the earth is approaching a heavenly body, the lines in the spectrum of that body are all shifted slightly toward the violet end, owing to the apparent shortening of each wave-length by the motion. If the earth and the heavenly body are receding from each other, there is a similar displacement of the lines toward the red end. The rotation of Saturn's rings has been experimentally demonstrated in this way, and the velocities of approach and recession of many of the brighter fixed stars have also been determined. Certain stars have been demonstrated to be double, by the discovery that the lines of their spectra are periodically double and single; the lines appearing single when the relative motion of the two components is perpendicular to the line of sight, and double when the positions of the component stars are such that one star is approaching the earth while the other is receding from it. The orbits of certain of these stars have been determined by such measurements, even when the components of the systems are so close together that no telescope can show them separately, nor make them appear otherwise than as a single point of light.

Dop'plerite (named after B. Doppler, the first to bring it to notice), an amorphous mineral occurring in elastic or partly jelly-like masses found in peat-beds in Styria and Switzerland, and regarded as a fossil peat. When fresh it is a brownish-black, with a dull brown streak and greasy subvitreous lustre, insoluble in alcohol or ether. Dopplerite is also the name of a related mineral, grayish, earthy, and plastic in the fingers when fresh.

Dor, or Bongo (q.v.), the names given to a mixed tribe of negroes living in Central Africa, in the lowlands of the Bahr-el-Ghazal, eastern Sudan. The race is of medium size, attaining splendid muscular development. Their skin is red-brown. They are noted for remarkable productions in iron and wood work.

Dor, or Dorr, a species of beetle, belonging to the family of earth-borers. It is of a glossy violet, black, or deep greenish-black. The club of the antennæ is yellowish, the elytra smooth, but slightly punctated, as is the thorax. It may often be seen flying about in the summer evenings. Its size and weight render it very unwieldy on the wing, so that it has but little power of guiding itself, and apparently none of checking its course quickly, for it strikes against all kinds of objects, but without suffering any damage. The female lays its eggs in patches of cow-dung. It is about an inch long. It is also called dor- or dorr-beetle, dorfly, and buzzard-fly.

Dor, or Mont Dore, môñ' dōr (often written Mont d'Or), a chain of mountains in France belonging to the group of the Auvergne Mountains, in the department of Puy-de-Dôme. They are of volcanic formation. The Puy-de-Sancy, the highest peak of central France, is 6,190 feet.

Dora d'Istria, dō'rä dēs'trē-ä, pseudonym of ELENA GHICA, Rumanian author: b. Bucharest 22 Jan. 1829; d. Florence, Italy, 20 Nov. 1888. She married the Russian Prince Kolzow-Massalsky. Her first work, 'Monastic Life in the Eastern Church,' alleges monasticism to be the principal obstacle to civilization in eastern and southern Europe. Her other works include: 'German Switzerland'; 'Women in the East'; 'Women, by a Woman.' She contributed many literary and historical essays to German, Italian, French, and Greek periodicals. Her studies on Albanian poetry gave rise to a nationalistic and literary movement among the Albanians. The Greek Chamber of Deputies, in April 1868, named her "high citizeness of Greece."

Doran, John, English essayist and critic: b. London 1807; d. there 28 Jan. 1878. He wrote: 'The Wandering Jew,' when he was 17, and the Surrey theatre staged it. His maturer performances, 'Table Traits and Something on Them' (1854); 'New Pictures and Old Panels' (1859); and a 'History of Court Fools' (1858), have merit.

Dorat, Claude Joseph, klōd zhō'zĕf dō-rä, French poet: b. Paris 31 Dec. 1734; d. there 29 April 1780. He renounced the study of law, and afterward the military service, into which he had entered as a musketeer, and devoted himself entirely to poetry. He wrote numerous dramas which were unsuccessful. He has succeeded better in songs, tales, and poetical epistles, but though he had great facility in composition, his works are not much esteemed. Dorat's works appeared in Paris complete in 20 volumes (1786).

Dorcas Gazelle, the best known of the genus of gazelles, very common in northern Africa, Asia Minor, Arabia, and Syria. It attains a height of two feet; has tapering ringed horns from 9 to 10 inches long; and is of a tawny color with white under parts. It is noted for its speed, is naturally very wild, but easily becomes domesticated, and owing to its beauty and gracefulness is frequently alluded to in Oriental poetry. Its name is derived from the Greek *δορκάς*, through *δέρκεσθαι*, to look, owing to the size and brightness of its eyes.

Dorcas Society, the name given to an association of ladies who make or provide clothes for needy families, distributing the garments free or at a nominal cost. The name is taken from Acts ix. 39: "And all the widows stood by him weeping, and showing the coats and garments which Dorcas made, while she was with them."

Dor'chester, Daniel, American Methodist clergyman: b. Duxbury, Mass., 11 March 1727. He was educated at Wesleyan University and entered the Methodist ministry in which he has been prominent as pastor and presiding elder. He has been at various times a member of the Connecticut Senate and the Massachusetts House of Representatives, and has published: 'Concessions of Liberalists to Orthodoxy' (1878); 'Problem of Religious Progress' (1881); 'Latest Drink Sophistries versus Total Abstinence' (1883); 'The Liquor Problem in All Ages' (1884); 'The Why of Methodism' (1887); 'Christianity in the United States' (1888).

Dorchester (ancient Roman DURNOVARIA or DURINUM), England, a municipal borough, the county town of Dorsetshire. In March, 1645, Cromwell held the town as his headquarters

with 4,000 men, and in 1685 Judge Jeffreys held his "bloody assize" here, when 292 received sentence of death as being implicated in Monmouth's Rebellion. A Roman amphitheatre, in a good state of preservation, is near the town.

Dorchester, Mass., since 1870 one of the wards of the city of Boston. Dorchester, originally called Mattapan, was settled in 1630 by the Puritans, but the name was soon changed to Dorchester in memory of the English home of some of the settlers. It was by fortifying Dorchester Heights in March 1776 that Washington forced the evacuation of Boston by the British army. The place is noted as the birthplace of Edward Everett. The population is counted as a part of that of Boston.

Dorchester, New Brunswick, town, county-seat of Westmoreland County; at the junction where two small rivers enter Shepody Bay; and on the Intercolonial R.R. The industries are principally ship-building and nearby quarrying. Pop. (1902) 7,105.

Dorchester Heights, now **South Boston,** Mass. This hill on the peninsula, southeast of Boston proper, across a navigable channel, commands the city; and in the Revolution, when Boston was held by Howe in the winter of 1775–6, it was obviously of the first importance to fortify it. Howe neglected to do so, and on the evening of 4 March 1776, under Washington's orders, Gen. John Thomas, with some 2,500 men and the proper implements, took possession of the heights, and by the next morning a sufficient entrenchment had been thrown up. Howe promptly agreed to evacuate Boston if unmolested, and did so on the 17th, leaving all his guns and supplies unharmed for the Americans.

Dordogne, dōr-dōn-yė, a department of France which includes the greater part of the ancient province of Périgord, and small portions of Limousin, Angoumois, and Saintonge. It lies between Haute-Vienne on the north, Carreze and Lot on the east, Lot-et-Garonne on the south, and Charente, Charente-Inférieure, and Gironde on the west. Area, 3,550 square miles, of which about a third is fit for the plow. The chief minerals are iron, which is abundant, slate, limestone, marble, and other stone. Mining, iron manufacture, etc., are carried on to a considerable extent, and there are a number of vineyards. Also noted for its production of wines and truffles. The climate is mild, but somewhat changeable. Pop. (1901) 452,951. The river Dordogne, principal river of the department, rises on the flanks of the Puy-de-Sancy, flows west-southwest, and after a course of 200 miles unites with the Garonne in forming the Gironde.

Dordogne, a river of France, rising near Mt. Dore and flowing west for 305 miles, uniting with the Garonne about 15 miles north of Bordeaux. The river is navigable for steamers for nearly 190 miles.

Dordrecht, dōr'drĕnt. See DORT.

Doré, Paul Gustave, pōl güs-tāv dō-rā, French artist: b. Strasburg 6 Jan. 1833; d. Paris 23 Jan. 1883. In 1845 he was sent to the Lycée Charlemagne at Paris, and three years later his early developed skill as a designer and draughtsman of humorous and satirical subjects gained him a place among the illustrators of the 'Journal pour Rire.' From 1848 to 1853 he contributed to the Salon a series of pen drawings, such as 'Les Pins Sauvages'; 'Le Lende maundes Orages'; 'La Prairie'; etc., which attracted much attention. In 1857 he had honorable mention for landscapes and a picture of the battle of Inkerman. His productivity was extraordinary, and embraced almost all classes of subjects. He is best known in England as the illustrator of the Bible, 'Don Quixote,' and of the works of Dante, Milton, and Tennyson ('Idylls of the Kings'). He also illustrated Rabelais and works by Chateaubriand, Balzac, and other writers. As a painter he was less successful than as an illustrator of books. His works of this class were 'Paolo and Francesca da Rimini' (1863); 'The Neophyte' (1868), and 'Christ's Entry into Jerusalem' (1876).

Dore'mus, Robert Ogden, American chemist: b. New York 11 Jan. 1824; d. New York City, 22 March 1906. He was graduated at New York University in 1842, and from its medical department in 1850, having established his chemical laboratory in New York in 1848. He filled the chair of chemistry at Bellevue Hospital Medical College and at the College of the City of New York. He patented noted chemical processes and fire extinguishers and was a noted expert in toxicology.

Doremus, Sarah Platt Haines, American philanthropist: b. New York 3 Aug. 1802; d. there 29 Jan. 1877. She was married to Thomas C. Doremus in 1821. With several others she organized the Greek Relief Society in 1828, and with Catharine Sedgwick established in 1842 a Home for Women from Prison, since known as the Isaac T. Hopper Home. She assisted in founding the House and School of Industry and was officially connected with various benevolent institutions, besides working for a half century in behalf of foreign missions. During the Civil War she labored for sick and wounded soldiers, both North and South.

Doria, dō'rē-ā, one of the most powerful families of Genoa. It became distinguished about the beginning of the 12th century, and shared with the families Fieschi, Grimaldi, and Spinola the early government of the republic. These four were known as *Magnæ quatuor prosapiæ*, the four great families of this republic. The Dorias and the Spinolas belonged to the Ghibelline, the Fieschi and the Grimaldi to the Guelph faction; but as this division does not exhaust the combinations of which the number four is capable, the two distinct sections entertained their own private jealousies and quarreled among themselves, Guelph with Guelph and Ghibelline with Ghibelline, making, as it were, a bear-garden of the dark and deep streets of their formidable city.

Doria, Andrea, ān drā'ā, Genoese admiral: b. Oneglia 30 Nov. 1468; d. Genoa 15 Nov. 1560. He entered the Pope's guards and afterward passed into the service of the Duke of Calabria, who commanded in Italy for the king of Aragon. He was rapidly promoted, and Alphonso II. gave him a command against Ludovico Sforza, Duke of Milan. When the French had left Italy the Genoese entrusted the reconstruction of their fleet to Doria. He was first employed in suppressing the African pirates, from

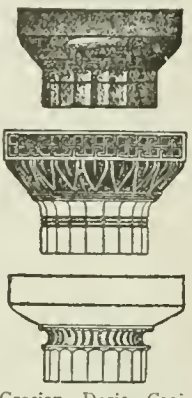
whom he captured a large booty, but was soon after exiled, and entered the service of Francis I., who named him admiral of the French galleys. Displeased with some demands of the French king, who in answer to his complaints deposed him from his command, he entered the service of Charles V. in 1528. His defection proved disastrous to the French cause in Italy. He occupied Genoa without resistance on 12 Sept. 1528, and his further successes contributed to the re-establishment of peace. He re-established order in Genoa, and organized the government on a new basis, which became permanent during the independence of the republic. Charles bestowed on him the highest honors, and received in exchange the most important services. In 1532 he took Koron and Patras, in Greece, from the Turks, and in 1535 assisted in the capture of Tunis. He assisted next year in a descent on Provence, took Toulon, and ravaged the coasts of the Gulf of Lyons. The emperor and the king of France had afterward an interview, which has become historical, on board his galley, with a view to the conclusion of peace. This interview took place at Aigues-Mortes in July 1538. In 1547 he narrowly escaped assassination in a conspiracy raised in Genoa by the Fieschi. His nephew was killed in this conspiracy, which excited him to some severities approaching to the barbarity of earlier times. Doria has been accused, probably with justice, of selling his sword too freely, and to too many opposing interests; but his services to his country have earned him the titles of *father* and *liberator*, which were conferred on him, together with the censorship for life, by the Genoese senate in 1528.

Do'rian Mode, the standard Greek and ecclesiastical mode, the first of the authentic church tones or modes, from D to D, with its dominant note of A. It resembles the key of D minor, but with the B natural and no C sharp. It is characterized by its severe and austere progressions, and is especially adapted to religious or warlike music. Many of the old German chorals are written in this mode.

Dorians, one of the four great branches of the Greek nation. They derive their name, according to legend, from Dorus, the son of Hellen. They dwelt first in Histiæotis, were then driven by the Perrhæbi into Macedonia, forced their way into Crete, where the lawgiver Minos sprang from them, built the four Dorian towns (Dorica Tetrapolis) at the foot of Mount Œta, between Thessaly, Ætolia, Locris, and Phocis, and subsequently, together with the Heraclidæ, made a settlement in the Peloponnesus, where they ruled in Sparta. Colonies emigrated from them to Italy, Sicily, and Asia Minor. The Dorians were in many ways the reverse of the Ionians. The Doric manner always retained the antique style, and with it something solid and grave, but at the same time hard and rough. The Doric dialect was broad and rough; the Ionic, delicate and smooth; it was the form made use of in solemn odes, for example, in hymns and in choruses forming part of the national celebrations, and the acting of the drama at Athens. The Cretan and Spartan legislative codes of Minos and Lycurgus were much more rigid than the mild Athenian institutions of Solon. The Spartan women wore the light tucked-up hunting-dress, while the Ionian females arrayed themselves in long sweeping garments. Both have been idealized by artists: the one in Artemis and her nymphs, the other in Pallas Athene and the Canephoræ. The same contrast appears no less strikingly in their architecture, in the strong, unadorned Doric, and the slender, elegant Ionian columns. See Müller, 'Die Dorier'; Grote, 'History of Greece.'

Dor'ic Order, in architecture, the second of the five orders, being that between the Tuscan and Ionic.

Grecian Doric.—The Doric column was first adapted to edifices having the proportions, strength, and beauty of the body of a man. The trunks of trees probably suggested the first idea of columns, but in the Doric style the proportions of a man appear to have been adopted. A man was found to be six times the length of his foot, hence the plain Doric columns were made six diameters in height. From the middle of the 7th century to the end of the 6th century B.C., the Doric appears to have been the only style of architecture used by the Greeks, and its highest example is the Parthenon of Athens.



Grecian Doric Capitals. 1, plain; 2, jointed; 3, at temple of Ceres in Paestrum.

Roman Doric.—An imitation of the Grecian, with a true Greek entablature and a molded base. The column is slenderer than that found in the best Greek examples, and is possibly of Etruscan proportions.

Dorigny, Louis, loo-ē dō-rēn-yē, French engraver: b. 1654; d. Verona, Italy, 1742. He with a son of Michael Dorigny (q.v.). He entered the school of Lebrun, and made a journey to Italy, where he copied the great masters.

Dorigny, Michel, mē-shel, French painter and engraver: b. St. Quentin 1617; d. Paris 1665. He was a scholar of Simon Vouet, whose works he etched, and whose faults in drawing he copied. His style of execution is bold, and his management of light and shade good. He became professor in the Academy at Paris.

Dorigny, Sir Nicholas, French engraver: b. Paris 1658; d. 1746. He was a son of Michael Dorigny (q.v.). He spent 28 years in Italy in studying the most illustrious masters, and 8 in engraving the famous cartoons of Raphael, at Hampton Court, for which he received the honor of knighthood from King George I. In 1725 he became a member of the Academy at Paris. One of his best engravings, besides his cartoons is the 'Transfiguration,' from Raphael, and the 'Apotheosis of St. Petronilla,' after Guercino. His engraving is easy and strong, and the work of the needle and the graver happily united.

Do'rion, Sir Antoine Aimé, Canadian jurist: b. St. Anne de la Perade, P. Q., 17 Jan. 1818; d. 3 May 1891. He was called to the bar in 1842 and became chief justice of the Province of Quebec in 1874. He held various cabinet positions and was knighted in 1877. During his

political career he was the leader of the French-Canadian Liberal party of the Province of Quebec.

Do'ris, a small mountainous district of ancient Hellas, was the home of the Dorians (q.v.). It is now a part of the modern government of Phocis. Doris was also the name of a district in Asia Minor on the coast of Caria, inhabited by colonists from the Peloponnesus.

Doris, in mythology. See NEREUS.

Doris, in natural history. See SEA-LEMON.

Dor'king, England, town in Surrey, 22 miles southwest of London, noted for its breed of fowls. It is the scene of the fictitious 'Battle of Dorking.'

Dorking, a fowl. See POULTRY.

Dormant Partner, a commercial term, almost obsolete to-day, having given way to the more familiar expression silent partner (q.v.).

Dormant State. See HIBERNATION.

Dormer Window (Old French *dormeor*, a sleeping-room), a vertical window usually flush with the wall of the house and standing in a projection built out to receive it from a sloping roof. In ordinary house-building serves as an ornament and at the same time lighting and enlarging an attic chamber. Very picturesquely used throughout France, Belgium and the Netherlands. In Gothic and Renaissance architecture the dormer window effect was often employed on beautiful stone edifices.

Dormitory (Fr. *dormitoire*, from Lat. *dormire*, "to sleep"), formerly in a monastery or nunnery sleeping quarters either divided into cells or cubicles, opening upon a corridor, or one great apartment divided by partitions or curtains. In connection with American colleges and similar institutions the dormitory is often an entire building divided into bed-rooms.

Dormouse, the common name given to the family *Myoxidæ*, natives of the Old World. They are pretty little creatures, with soft, fine fur, and long, squirrel-like tails; but, unlike the squirrels, which they somewhat resemble in habits, they have no cheek-pouches. There are in all four genera of the *Myoxidæ*, containing about a dozen species, the best known of which is the red dormouse, "hazel mouse," or "muscardine" (*Muscardinus avellanarius*), which lives in the woods in most parts of Europe. It is about the size of the common house mouse; has a rather large head, a pointed muzzle, large, prominent eyes, and a hairy tail. It is reddish in color above, and white below. Its food consists of acorns, nuts (especially hazel nuts), and grain; which it stores for winter use, much as squirrels do. In the coldest weeks of winter it curls up and sleeps, waking, however, at intervals, in milder days, to feed upon its gathered stores. Its nest is usually made of tangles of herbage, with an opening at the top, and hidden in the underbrush. The fat dormouse (*Myoxis glis*) is larger than the red dormouse, and duller in coloring. It inhabits the forests of southern Europe, where it may be found leaping with remarkable agility from tree to tree. The garden dormouse (*Eliomys nitela*) lives nearer to man, being found in gardens, and often in barns. It destroys fruit grown along walls and trellises. The French call it "lerot"; the Germans "Gartenschlafer."

Dorner, dôr'nĕr, Isaak August, German Protestant theologian; b. near Tuttlingen, Würtemberg, 20 June 1809; d. Berlin, 8 July 1884. He studied theology and philosophy at Tübingen; and had already filled chairs at Tübingen, Kiel, Königsberg, Bonn, and Göttingen, when in 1801 he was called to be professor at Berlin. His greatest work is the 'History of the Development of the Doctrine of the Person of Christ' (1801–03). Among his other works are 'History of Protestant Theology' (1871); 'System of Christian Doctrine' (1880–4); 'Christian Ethics' (1887).

Dor'nick, a species of coarse, figured linen, named from Tournai or Doornick in Flanders. The manufacture introduced into England by the Dutch who fled from the persecutions of Alva was long confined by law to inhabitants of Norwich and Pulham. A similar cloth called dornock was made at Dornock, Scotland.

Dornoch (dôr'nŏk) **Firth**, an arm of the sea, on the east coast of Scotland. The town of Dornoch is near the entrance. Fishing is valuable, but navigation is difficult.

Dornock. See DORNICK.

Dorohoi, dō-rō-hoi', Rumania, a town in the northwest of Moldavia, near the Austrian frontier. Pop. 15,000, half being Jews.

Dorpat, dôr'pät, or **Dörpt** (Lettish, *Tehrpat*), Russia, city in the government of Livonia, on the Embach, about 135 miles northeast of Riga. Dorpat is chiefly remarkable for its university, which was founded in 1632 by Gustavus Adolphus, when the Swedes were masters; it was suppressed, in 1656, by the Muscovites; and re-established by the Emperor Alexander, in 1802–3. To this institution is attached an observatory, which the labors of Dr. Struve have made famous, and a library with about 300,000 volumes. Pop. 45,000.

Dorr, Julia Caroline (RIPLEY), American poet and prose writer; b. Charleston, S. C., 13 Feb. 1825. She removed to Vermont in 1830 where she married in 1847 S. M. Dorr, who died in 1884. Among her volumes of verse are: 'Poems' (1871); 'Friar Anselm' (1879); 'Daybreak, an Easter Poem' (1882); 'Afternoon Songs' (1885). Her prose works include: 'Lanmere' (1856); 'Sibyl Huntington' (1869); 'Expiation' (1872); 'Farmingdale' (1854); 'Bermuda,' a volume of travel (1884); 'Bride and Bridegroom, or Letters to a Young Married Couple'; 'The Flower of England's Face' (1895); 'A Cathedral Pilgrimage' (1896); 'Afterglow' (1900); 'In Kings' Houses' (1898).

Dorr, Thomas Wilson, American politician; b. Providence, R. I., 5 Nov. 1805; d. there 27 Dec. 1854. He was a member of the Assembly of Rhode Island in 1833–37, and was the leader of Dorr's Rebellion (q.v.). This was brought about by dissatisfaction with the constitution of the State; and a call for a constitutional convention was made by a party called the Suffrage Party, of which Dorr was the head. A new constitution was made by this convention and submitted to the people in 1841, receiving a majority of the votes. Dorr was convicted of high treason and sentenced to imprisonment for life, but was released under a general amnesty act in 1847, and restored to his civil rights in 1852.

Dorr Rebellion, 1840-2. Rhode Island after the Revolution continued under her charter of 1663 for nearly three quarters of a century (see CONSTITUTIONS, STATE), it being already that of a self-governing democracy. But it had two features growingly undemocratic, one of them sure to end in an explosion; the town representation in the legislature was based on 17th-century ratios of importance, since then greatly changed — thus, Newport with some 8,000 people had six members, Providence with 23,000 had four, Smithfield with 9,500 had two; and the suffrage constituted a propertied minority with primogeniture, being restricted to holders of $134 worth of real estate or $7 annual renters, and their eldest sons. Of 22,000 to 23,000 taxable polls, only 9,590 were freemen; Providence with above 23,000 inhabitants had 1,610 voters, Woonsocket with some 3,000 had 150, etc. Over $1,000,000 of personal property in Providence was unrepresented. That city was naturally the focus of discontent; Newport as naturally the champion of the established order.

From 1834 on, when he was first chosen to the legislature, the discontent was voiced by Thomas Wilson Dorr, b. 5 Nov. 1805, a lawyer of a wealthy Whig family, and a Harvard graduate. He formed something like a suffrage party organization; but it dissolved from discouragement in 1838. A convention representing only the landholders meantime threw out with only seven votes a proposition to extend the suffrage, and the Whigs smothered the agitation till after Harrison's election in the fall of 1840. Then Dorr, who had joined the Democrats, organized mass-meetings, and the suffrage became the burning question of the hour during the winter. As the legal organs of relief were packed against them by the very system against which they protested, the disfranchised had no recourse but revolution. On the claim of "natural right," they held a convention in October 1841, drafted a constitution, and called for a popular vote upon it; only their own party voted, but by fictitious lists a vote of some 14,000 was computed, about twice the actual number cast. This being a majority of the legal voters, the suffrage party proclaimed the "People's Constitution" as the lawful régime of the State, 13 Jan. 1842. Meantime the landholders' party had called a legal convention, which met in November, split into angry factions, and adjourned to 14 Feb. 1842. But the proclamation of the revolutionary constitution sobered them down; they drew up one practically as liberal as the other, and for the first time allowed those qualified under it to vote on it. The suffrage party was now offered all it claimed; but it was too much committed to its new principle of mass-rule to recede, and the "Landholders' Constitution" was voted down, 8,689 to 8,013. On 13 April the suffragists held an election under the People's Constitution, at which only their own party voted, and chose Dorr governor, with a legislature and corps of State officers. Of course all these proceedings were legally null, and the "Law and Order Party," as they called themselves, recognized them only as treasonable attempts to overturn the legal government.

At an extra session in March the legislature had made the taking of office under the Dorr government treason, and acting as moderator or clerk at their elections a serious misdemeanor; a law dubbed by the Dorr party the 'Algerine Act.' At the regular April elections Samuel W. King was chosen governor; and another extra session empowered him to proclaim martial law, and call on the federal government for the help against domestic insurrection guaranteed by the Constitution. President Tyler replied that help should be furnished when violence had actually supervened, but the government could not interfere on a mere apprehension. On 3 May Dorr and his party marched into Providence, and after debating a forcible occupation of the state-house, began legislative sessions in a disused iron foundry. They sat two days, formally repealed the "Algerine Act," demanded of Gov. King the custody of the State property, notified the federal government of their formation of the legitimate State government, etc., and adjourned to 5 July, but never met again. The regular legislature met at Newport 4 May, and the governor again appealed to the President, receiving the same answer; but the military commanders of the vicinity were ordered to keep in touch with the State authorities. Dorr went to New York and elsewhere for recruits and funds, came back on the 16th, and on the night of the 17th-18th undertook to capture the Providence arsenal, but his own men disabled his cannon and his force melted away — his chief adherents by this time being sick of the farce, when the other party were ready to grant all their demands. Dorr escaped into Connecticut (where the governor refused to give him up on requisition), and prowled around the border for several weeks, getting men and stores together — the former mainly young fellows on a "lark"; finally late in June he crossed the border, and the President decided that the time had come to order United States troops to interfere. On the 26th a crushing force marched against Dorr at Chepachet, R. I., and his men on that and the next day dispersed without waiting the event. Dorr remained in hiding for some weeks, and a reward was offered for him; in October he returned and gave himself up for trial, was convicted of high treason in March 1844, and sentenced to life imprisonment. He was pardoned in 1847, and restored to civil life in 1852. He died 27 Dec. 1854. Meantime, in November 1842, a new convention had been held by the regular authorities, adopted by the people 21–3 Nov. 1842, and became operative in May 1843. The suffrage was practically made universal. The proceedings of the state government were held legal by the United States Supreme Court in *Luther v. Borden*, argued by Webster (see his Speeches), and decided by Taney. It must be said for Dorr that but for the menace of civil war the suffrage never would have been extended; after the offer of the "Landholders' Constitution," however, he and his party became inexcusable disturbers of public order, risking bloodshed for the question of the legal theory under which the rights already obtained should be held. The great repository of material on this subject is the House Report of the 28th Congress, 1st session, No. 546; the best single summary is Francis Bowen's in the 'North American Review' (1844).

Dorrit, Amy, the "Little Dorrit" of the novel of the same name, by Charles Dickens.

D'Orsay, Alfred Guillaume Gabriel, äl'frā gē-yôm gäb-rē-ĕl dôr-sā, COMTE, French leader of fashion; b. Paris 4 Sept. 1801; d. there

4 Aug. 1852. In 1822 he became acquainted with Lord and Lady Blessington, and renounced his military career for the pleasure of their society. In 1827 he married Lord Blessington's only daughter by a first marriage, but a separation shortly followed, and Lord Blessington having died in 1829, D'Orsay returned to England with Lady Blessington, where they became the centre of a circle distinguished for art, rank, literature, and accomplishments.

Dorse, a small codfish found in the Baltic. Formerly supposed to be a distinct species (*Gadus callarias*), but now believed to be the young of the common codfish.

Dor'setshire, a maritime county of England; area, 632,272 acres. Portland stone is quarried in this county.

Dorsey, Anna Hanson, American poet, novelist, and dramatist: b. Georgetown, D. C., 12 Dec. 1815; d. Washington, D. C., 26 Dec. 1896. Some of her works were reprinted in foreign countries; among them being: 'May Brooke' (1856); and 'Oriental Pearl,' translated into German (1857). Her novels, 'Warp and Woof,' and 'Palms,' were published in 1887.

Dorsey, Ella Loraine, American author: b. Washington, D. C., 2 March 1855. She early devoted herself to journalism, serving for 10 years on the Washington papers and later in several other cities. She began her specialty of Catholic juvenile fiction in 1886. She has written much prose and verse for the magazines, and among her published books are: 'Midshipman Bob'; 'Jet, the War Mule'; 'The José Maria'; 'Saxby's Angels'; and the 'Two Tramps.'

Dorsey, James Owen, American ethnologist: b. Baltimore, Md., 31 Oct. 1848; d. Washington, D. C., 4 Feb. 1895. He was ordained a deacon in the Protestant Episcopal Church, and was engaged in parish work in Maryland from 1873–8. He was then appointed ethnologist to the United States Geological and Geographical Survey of the Rocky Mountains; and after spending some time at the Omaha Reservation in Nebraska, was transferred to the United States Bureau of Ethnology. His chief works are: 'On the Comparative Phonology of Four Siouian (Sioux) Languages' (1883); 'Siouian Folklore and Mythologic Notes' (1884); 'Kansas Mourning and War Customs' (1884); 'Indian Personal Names' (1886).

Dorsey, Sarah Anne, American prose-writer: b. Natchez, Miss., 16 Feb. 1829; d. New Orleans, La., 4 July 1879. She was a linguist and a student of Sanskrit. Included in her writings are: 'Lucia Dare' (1867); 'Panola, a Tale of Louisiana' (1877); 'Atalie'; and 'Agnes Graham.' She was amanuensis to Jefferson Davis in the preparation of his 'Rise and Fall of the Confederate Government.'

Dorsey, Stephen Wallace, American politician: b. Benson, Vt., 28 Feb. 1842. He served in the Federal army during the Civil War, and subsequently removing to Arkansas was active in politics. He was a member of the Republican State and county committees; was elected to the United States Senate in 1873; and was secretary of the Republican National Committee for the campaign of 1880. At the time of the "star route" exposures he was accused of having influenced legislation in the Senate, was indicted before the grand jury in Washington; but was acquitted on his second trial. After 1880 he withdrew from politics.

Dorste'nia (named after Dr. Dorsten, a German botanist), a genus of plants of the natural order *artocapaceæ*, natives of tropical America. The genus is remarkable for the receptacle in which the numerous small flowers are sunken, the female flowers being the most depressed. The rootstocks of various species are used in the preparation of a medicine, once in much repute against low fevers, and as a mild stimulant and diaphoretic, also as efficacious against snake bites, whence the Spanish name, *contrayerva*.

Dort, dôrt, or **Dordrecht**, dôr'drĕnt, Holland, city in the province of South Holland; 10 miles southeast of Rotterdam. An inundation in 1421, in which upward of 70 villages were destroyed and 100,000 people drowned, separated the site on which Dort stands from the mainland. It was founded in 1013. Here, in 1572, the states of Holland, after the revolt from Spain, held their first assembly; and sat from 13 Nov. 1618 to 19 May 1619, the conclave of Protestant divines known as the Synod of Dort, which condemned the doctrines of Arminius as heretical, and affirmed those of Calvin. Dort is the birthplace of the brothers De Witt of Cuyp, and Ary Scheffer; to the last a statue was erected in the market-place in 1862. Pop. (1900) 38,804.

Dort, Synod of, an assembly of Protestant divines convoked at Dort (Dordrecht) in 1618–19. Besides the Dutch and Walloon divines, it included representatives from England, Scotland, Switzerland, and part of Germany. It was chiefly occupied in considering the doctrines of Arminius (see ARMINIANISM). It originated the project of translating the Bible into Dutch, which was executed after 19 years' labor. The translation is known as the 'Dort Bible.'

Dortmund, dôrt'moont, Germany, city in the province of Westphalia, on the Ems, 47 miles north-northeast of Cologne. In 1899 it was connected by canal with the canalized Ems (giving a waterway to Emden on the North Sea), and extensive harbor accommodation has been provided. It owes its recent great and increasing prosperity to its becoming the centre of several important railway systems, to the opening of extensive coal mines in the vicinity, and to the active manufactures of iron, steel, machinery, railway plant, etc. It was once a free imperial and Hanseatic town, and the seat of the chief tribunal of the Vehme. Pop. (1900) 142,418.

Dorus, the eponymous ancestor of the Dorians (q.v.).

Dory, or John Dory (*Zeus faber*), a fish belonging to the family *Zeniidæ*, somewhat allied to the mackerel, and celebrated for the delicacy of its flesh. It has the spinous portions of the dorsal and anal fins separated by a deep emargination from the soft-rayed portion, and has also the base of all the vertical fins, and the carina of the belly anterior to the anal fin, furnished with spines or serratures; color, yellowish-green, with a blackish spot on each side; dorsal and anal fins with furcate spines, and a long filament produced from behind each dorsal spinous

ray. The dory has exceedingly protractile jaws, which enable it to capture small fish, etc., when concealed in the ooze or weeds, after slowly moving upon them in a stealthy, catlike manner. It is found on the coast of England, and on the Atlantic shores of Europe, and in the Mediterranean. A related species (*Zenopsis ocellatus*) has been once taken on our coasts at Provincetown, Mass.

Also a North Atlantic species of rock-fish (q.v.).

Dos Passos, John R., American lawyer: b. Philadelphia 1854. He is of Portuguese descent. He studied law; served in the Federal army during the Civil War, and after practising law in Philadelphia for some time went to New York in 1867, where he was very successful in the criminal branch of practice. Later he became an authority upon banking, corporate and financial law. He has written considerably. Among his published works are: 'A Treatise on the Law of Stock Brokers and Stock Exchanges' (1882); 'The Interstate Commerce Act' (1887); 'Commercial Trusts'; 'The Anglo-Saxon Century' (1903).

Dôseh, dō'sĕ, an Arabic word meaning "treating," denotes a remarkable ceremony, which, until its suppression in 1884, used to take place in Cairo annually on the feast of the prophet's birth (Moolid), in the third month of the Mohammedan year. A party of dervishes of the Sa'di order, to the number of a hundred or more, lay down on their faces, side by side, with their arms doubled under their foreheads. A dozen more ran along upon their comrades' prostrate backs, beating drums, and shouting "Allah." Then the sheikh, mounted, rode along upon the line of bodies, from whom audible prayers could be heard proceeding. It was in consequence of evidences of considerable injury inflicted by the iron-shod hoofs that the khedive Tewfik suppressed this singular religious rite. See E. W. Lane, 'Modern Egyptians,' xxiv.; Butler, 'Court Life in Egypt.'

Dosith'eans (from their founder, Dositheus), a sect founded by Dositheus, whose life and labors were in Samaria. The popular belief is that he was the first Christian "heretic." Mosheim, on the contrary, thought that he was not a Christian at all, but a false Messiah, who lived at or about the time of our Lord. He is said to have been very rigid in his Sabbatarianism. His other opinions were partly Samaritan, partly Sadducean.

Dosith'eus, Jewish heresiarch of the 1st century A.D. He insisted on a painfully rigorous observance of the Sabbath, and died of excessive fasting. There was also a grammarian of this name in the 4th century, who wrote a Latin grammar for Greek boys.

Dosso Dossi, dŏs'sō dŏs'sē (properly Giovanni di Nicolo Lutero), Italian painter: b. near Mantua 1479; d. Ferrara 1542. His manner approaches to that of Titian, with whom he painted some apartments in the ducal castle. His paintings there represent bacchanalians, fauns, satyrs, and nymphs. In other paintings he imitated Raphael. Among eight of Dossi's pictures in Dresden, the 'Dispute of the Four Doctors of the Church' is distinguished as a masterpiece by accurate delineation and peculiar power of coloring, and is entirely in the style of Titian. His brother, Giovanni Battista (d. 1546) was a less celebrated painter.

Dost, Mohammed Khan, Afghan usurper: b. about 1790; d. 1863. He obtained possession of the throne of Afghanistan after the flight of Mahmud Shah in 1818; ruled with great ability, and although driven from his throne by a British army, was ultimately restored, and later became a steady supporter of British power in the East.

Dostoyevsky, Feodor Mikhailovitch, fā'ō-dōr mī-kāl'ō-vĭch dŏs-tō-yĕf'skĭ, Russian novelist: b. Moscow 11 Nov. 1821; d. St. Petersburg 9 Feb. 1881. After serving as an officer of engineers he devoted himself to literature, but becoming connected with communistic schemes was banished to the mines of Siberia, from which he returned in 1856 to resume his literary activity. His first novel, 'Poor People,' came out in 1846, and an English translation of it appeared in 1894. Among other of his works that have appeared in English are 'Crime and Punishment' (1868), a very powerful work, characterized by masterly psychological analysis and thrilling realism in description; 'Injury and Insult'; 'The Friend of the Family'; 'The Gambler'; 'The Idiot'; 'Prison Life in Siberia.' A complete edition of his works was published (1882–3).

Dotheboys Hall, the school which figures in Dickens' novel, 'Nicholas Nickleby.' It was kept by Squeers (q.v.). The name is a rendering of Do-the-Boys Hall. The effect of the exposure by Dickens of the conditions prevailing in some of the English boys' schools was a complete reformation in their methods and management.

Doto, one of the Nereids.

Dot'terel (*Charadrius-* or *Eudromias-morinellus*), a species of plover (q.v.) which breeds in the north of Europe and returns to the south for the winter. It is found all over Europe and northern Asia. The dotterel has always been highly esteemed for the table, but its extermination in Great Britain is more likely to result from the assiduity of the egg collector than of the sportsman, a consummation likely to be hastened from its habit of laying but three eggs, instead of four like most plovers. It likewise differs from all other species of plover in having the sternum fenestrated instead of notched posteriorly, and in the larger size and brighter colors of the female.

Dou, Gerard. See Dow, Gerard.

Douai. See Douay.

Douarnenez, doo-ār-nĕ-nĕs or -nĕz, France, a port in the department of Finistère, on the Bay of Douarnenez, eight miles northwest of Quimper by rail. It is important for the sardine fishery. Pop. 12,900.

Douay, doo-ā, or **Douai**, France, city in the department of Nord, on the Scarpe River, 18 miles south of Lille. It is one of the oldest towns in France. Its manufactures and trade are quite important. It is noted for the schools which were established here in the 16th and 17th centuries. English, Scottish, and Irish colleges, and novitiates of English Franciscans and Benedictines were all affiliated with the Douay University. Printing-presses and libraries furnished an opportunity for publishing

books for English Catholics. The university property was confiscated in 1793, in the revolutionary period; students and teachers fled to England, and to this migration the Roman Catholic college at Ushaw, near Durham, owes its origin. The English Benedictines still have an establishment at Douay. The library now in the town contains about 60,000 volumes and many valuable manuscripts. Pop. 32,146. See DOUAY BIBLE.

Douay Bible, the name commonly given to the version of the Vulgate text of the Scriptures made at Rheims in France for the use of English-speaking Catholics. The translators and editors of this version were Dr. William (afterward Cardinal) Allen, Dr. Gregory Martin, Dr. Richard Bristow, and John Reynolds, all of them alumni of Oxford University. The work of translating was done mostly by Dr. Gregory Martin, "a scholar of distinguished attainments both in Greek and Hebrew," says the eminent biblical critic, Dr. Westcott. The New Testament was published at Rheims in 1582 and the Old at Douay in 1609–10, both in quarto. The text has since that time undergone numerous revisions, chiefly for correction of its literary form which was faulty because of the employment of words of Latin origin and unintelligible for readers unacquainted with Latin, instead of the homely English equivalents, for example, "comessations" (revellings), ebriety, impudicity, agnition, coinquination, contristate, donary, exinanite, suasible: all mere Latin words with English terminations. This very serious fault was in revision after revision corrected with greatest thoroughness by Dr. Challoner (q.v.), whose first edition of the revised New Testament was published in 1749 and that of the Old Testament in the following year. Challoner's final revision has itself undergone revision several times since, but only for correction of minor errors and oversights. Despite its very serious defects the original Rhemish translation has elicited from a most competent judge, Dr. Westcott, 'History of the English Bible,' the praise of great fidelity to the text of the Vulgate. "The Rhemists," he says, "in their scrupulous and even servile adherence to the text of the Vulgate . . . frequently reproduced with force the original order of the Greek, which is preserved in the Latin; and even while many unpleasant roughnesses occur there can be little doubt that this version gained on the whole by the faithfulness with which they endeavored to keep the original form of the sacred writings. . . . The same spirit of anxious fidelity to the letter of their text often led the Rhemists to keep the phrase of the original when others had abandoned it. . . . When the Latin was capable of guiding them the Rhemists seem to have followed out their principles honestly; but whenever it was inadequate or ambiguous, they had the niceties of Greek at their command."

Double Bass or Base, sometimes called contrabass, is the largest and deepest voiced of the viol family. Though seldom used in solo work it is counted one of the foundations of the modern orchestra. Originally it had only three strings, but used to-day with four, from the pitch of the third E below the violin clef. The strings are tuned a fourth apart. It probably derives its name from the fact that it sometimes doubles the bass given to the 'cello or similar instrument in a score. It first appeared in the 16th century and has been attributed to the inventive genius of Gasparo da Salo.

Double Bassoon, also known as contrafagotto, stands in the same relation to the oboe family as the double-bass (q.v.) does to the stringed instruments, being the largest and deepest toned. It has a compass of more than three octaves upward from the third C (and even B♭) below middle C; an octave lower than the ordinary bassoon. It has a conical tube over 16 feet in length, but bent up so compactly that it causes no inconvenience to the player. Many great masters of orchestration have written liberally for it, especially Haydn, Beethoven, Spohr, and Mendelssohn.

Double Consciousness, a peculiar mental condition, illustrated by the celebrated story of Dr. Jekyl and Mr. Hyde, which describes a rare type of phenomenon occasionally met with in certain nervous affections. By double consciousness is meant, that at certain times, in the waking consciousness of the individual, certain dominant ideas control and impart to the individual a definite personality, known and recognized as such by his friends and associates, and that, at other times, also in a distinctly conscious state, an entirely different series of ideas may govern the person, making him think, feel, and act in a manner entirely different from that of his former personality. It would seem, from many recent studies concerning this phenomenon, that it is practically always a symptom of a diseased mental state and that one of the personalities, so-called, is distinctly pathological and does not pertain to the ordinary conscious states, but is a symptom of a hysterical or epileptic attack. Hypnotic double consciousness is difficult to write about, inasmuch as a large proportion of the observations made by seemingly reputable observers are plainly fictional; but there remains, over and above such untrustworthy accounts, a certain residue of observations which would tend to show that a true double consciousness might exist in the hypnotic phenomenon. Of course it is understood that in normal life, different phases of feeling come and go, and that all normal people do not feel the same at all times, but there is rarely in normal life the marked distinction between two phases of mental activity, such as is described as characterizing the phenomenon of double consciousness. In certain forms of psychical epilepsy, there is a phenomenon of great interest, the so-called automatic epileptic condition, during which the patient may be absolutely different from his former self. This state in epilepsy may persist for a few moments, a few hours, a few days or even extend for weeks. While in this condition the patient may act in a manner totally foreign to his previous self. It is probably true that the nucleus of the condition known as double consciousness must be found in the study of these automatic states that occur in epilepsy. Trance conditions, cataleptic phenomena, somnambulistic performances, etc., are certainly allied states, a complete judgment on which, however, must be reserved for future study. See Gower, 'Epilepsy'; Löwenfeld, 'Der Hypnotismus'; 'Annales des Sciences Psychiques.'

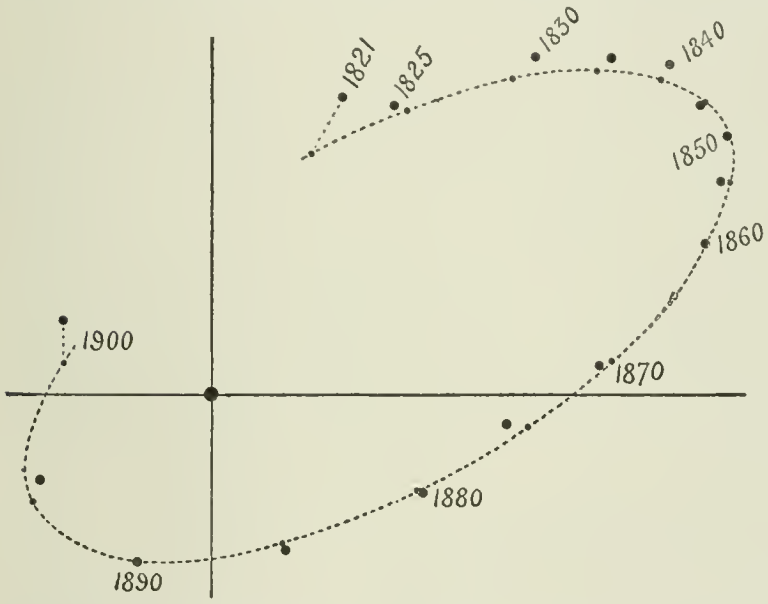
Double Dragon, Order of the, a military order of China, established to honor foreigners who had served China in a military capacity. In 1882 it was made to include other foreigners who had rendered service to the nation.

Double Eagle, a United States coin of the value of $20, the eagle being $10. The name is a book-word, the popular term being "twenty-dollar gold piece." The piece was authorized by Congress in March 1849, and the first ones were struck in 1850. The name refers to the figure of the eagle upon it. It was one of the coins authorized by the Act of 1873.

Double Flowers are flowers which, usually through cultivation, have their stamens and pistils developed into petals, by which the beauty of the flower may be enhanced, though its reproductive powers are sacrificed. All intermediate stages between stamens and petals can be seen in double-flowered roses and carnations. It is frequently observed that a multiplication of the leaf accompanies the conversion of stamens into petals; so that a single stamen may be represented by two or more petal-like leaves. Double flowers remain fresh two, three, even eight days longer than similar normal single flowers.

Double Standard, in economics the phrase double standard is used to signify a double standard of monetary value fixed by legislative enactment. It implies the existence of what is known as the gold standard on the one hand, and the silver standard on the other. Wherever the double standard in its integrity is in use a creditor is bound to accept payment of any sum in coins of either of the metals, gold or silver, which the debtor may choose to tender. See BIMETALLISM.

Double Stars are stars which, while they may appear single to the eye, are known, by telescopic observation, to consist of two constituents that are near enough together to justify the assumption of a physical connection. About 10,000 such stars are known. The first systematic study of these objects was made by Sir William Herschel, who, between the years 1779 and 1784, made extensive catalogues of them, because he thought it likely that they were only optically double, one component being really much more remote than the other, and the apparent duplicity being due to the fact that the two lie almost in the same straight line with us. If that were the case, the earth's orbital motion about the sun might be great enough to make an appreciable variation in the distance or direction of one star from the other, if the system were viewed at different times in the year. After recording the distances between many of these stars, as well as the direction of the line joining the two components, he went over them again to see if any changes could be noted; and in so doing (as his son, Sir John Herschel has recorded) "his attention was altogether diverted from the original object of the inquiry by phenomena of a very unexpected character, which at once engrossed his whole attention." Instead of finding an annual and alternate increase and decrease of the distance, and a corresponding periodic variation in their direction, he saw that in many cases there was a continuous change in both, advancing steadily in one direction. If this were due to the fact that the solar system and the two components of the double star were moving independently through space, we should expect the motion of either of the components, relatively to the other one, to be sensibly rectilinear. After the lapse of 25 years Herschel became satisfied that this is not always the case, for in some instances he found good evidence of actual orbital motion, and in 1802 he announced that "there exist sidereal systems, composed of two stars revolving about each other in regular orbits," in the same manner that the earth revolves about the sun, or the moon about the earth. About the year 1819 William Struve took up the systematic study of these stellar systems, and made a long series of most excellent measures of them covering a period of many years. Subsequently the work was taken up by other skilled observers, and we now have a vast mass of data of this sort, from which fairly good orbits of some of the systems have been obtained. The most comprehensive book on the subject is Crossley, Gledhill and Wilson's 'Handbook of Double Stars,' which is a treasury of numerical data and references, and also contains methods for computing the orbits of double stars, as well as advice concerning the making of observations. The star known to astronomers as "70 Ophiuchi" may be cited as



an example of a binary whose orbit has been determined with some degree of approximation. In reality, both of the components of a double star are in motion, each revolving about the common centre of gravity of the two; but it is known that in a system composed of two bodies revolving about each other no error is committed, so far as the relative motion of the two is concerned, by regarding one of them as fixed, and assuming that the other revolves about it. It is customary, therefore, to regard the brighter component of such a star as fixed. In the case of 70 Ophiuchi one star is of about the fourth magnitude, while the other is of about the sixth. In the diagram the large black spot at the intersection of the two straight lines represents the larger star, the straight lines themselves representing, respectively, a meridian and a declination-circle passing through it. The dotted ellipse represents the apparent orbit of the component star, as computed by Risteen from all the available data up to the year 1895. The large dots that appear irregularly along the ellipse, being sometimes within it and sometimes without, represent the observed positions of the companion star, for every five years; and the corresponding smaller dots that lie exactly upon the ellipse represent the corresponding positions of the component, as calculated from Risteen's orbit. (The orbit itself is based upon observations taken each year; but the observations intermediate to those shown have been omitted from the diagram in the interest of clearness.) According to the computation here cited, the period of revolution of 70 Ophiuchi is 88.42 years. In addition to the stars that are visibly double when viewed through the telescope, numerous stars are now known which have been proved to be double by means of spectroscopic observations. (See DOPPLER'S PRINCIPLE.) The periods of revolution of some of these are exceedingly short. Thus, one of the components of the telescopically double star Kappa Pegasi is itself a spectroscopic binary with a period of only six days.

Doubleday, Abner, American military officer: b. Ballston Spa, N. Y., 26 June 1819; d. Mendham, N. J., 26 Jan. 1893. He was graduated at the United States Military Academy in 1842, rising to the rank of colonel in 1870 (brevet lieutenant-colonel in 1865). He was second in command at Fort Sumter in 1861, firing the first gun in its defense, and he greatly distinguished himself at Gettysburg. He published: 'Reminiscences of Forts Sumter and Moultrie in 1860–1' (1876); 'Chancellorsville and Gettysburg' (1882).

Doubleday, Neltje Blanchan, American author: b. Chicago 23 Oct. 1865. She was married to F. N. Doubleday in 1886. She has published: 'The Piegan Indians' (1894); 'Bird Neighbors' (1897); 'Birds that Hunt and are Hunted' (1898); 'Nature's Garden: Our Wild Flowers and Their Insect Visitors' (1900).

Doubleday, Russel, American author: b. Brooklyn 26 May 1872. He was educated in private schools, and served in the United States navy during the Spanish-American war 1898. He has written: 'A Gunner Aboard the Yankee'; 'Cattle Ranch to College.'

Doublet, a close-fitting garment, covering the body from the neck to a little below the waist. It received its name from being originally lined or wadded for protection. At first it had short shirts, but these diminished as the body of the garment became fuller and more elaborate under the reign of Queen Elizabeth. During the period of Charles I. and after Charles II. it lost all pretense and dwindled into a sleeveless jacket, the forerunner of our modern waistcoat. Originally was introduced from France into England in the 14th century.

In lapidary work, a counterfeit stone composed of two pieces of crystal, with a color between them, so that they have the same appearance as if the whole substance of the crystal were colored. Again accomplished another way by taking a thin layer of a precious gem and fastening it on the line of the girdle to a piece of glass colored to match. Some invisible cement is employed for the purpose, such as gum mastic.

Doubling the Cube, a celebrated problem among the ancient Greek geometers. According to legend the problem originated in an oracle of Apollo delivered to the people of Delos, and hence it has been called the Delian problem. The altar of Apollo at Delos was a cube, and once when they had offended him he ordered that the size of it should be doubled. This was easily done, but had no effect in mitigating the pestilence, which was the usual consequence of Apollo's wrath. On applying to him again the reply was that they must not change the shape of the altar. Hence arose the problem to find the exact size of the side of a cube the contents of which should be twice that of another given cube. The problem, however, was not invented by Apollo, he had only cunningly taken advantage of a problem which had already occupied Hippocrates of Chios and other Greek geometers. This problem the Greek geometers failed to solve, although their efforts to do so proved useful in advancing the study of geometry. It is indeed incapable of arithmetical solution, as will be made clear by merely examining the cubes of the first few numbers consecutively.

The cubes of the numbers from 1 to 9 are:

1	2	3	4	5	6	7	8	9
1	8	27	64	125	216	343	512	729

Here it is evident that taking any given arithmetical unit, it is impossible to find a number depending on it of which the cube will be double that of the cube of any other number depending on the same unit. If, for example, the side of Apollo's altar measured 3 feet, the cubic content of the doubled altar would have to be 54 feet; but it is clear that no whole number will give 54 as its cubic, and as no fraction multiplied by itself will give a whole number, the exact dimensions of the side of this doubled altar cannot be given either in whole feet or in any finite fraction of a foot. This does not prove, however, that a cube of this size cannot exist, but only that between its side and that of a cube whose side is three feet no definite arithmetical ratio can be fixed.

Doubloon, dŭb-loon', a gold coin of Spain, equal in value to two pistoles. It was worth 1730 to 1772 about $8.24, from 1772 to 1786, $8.08, and from 1786 to 1848, $7.87. Although the coinage of the doubloon has ceased in Spain, coins still current are valued at $5.02.

Doubs, doo, France, (1) a department which is traversed by four chains of the Jura. Pop.

305,193. (2) Doubs, a river 250 miles in length, rises in this department.

Doubting Castle, the castle in 'Pilgrim's Progress,' where Christian and his companion Hopeful are imprisoned for a time by Giant Despair.

Doubting Insanity. See INSANITY.

Douc, dook, a species of small monkey (*Semnopithecus nemæus*), native to Cochin-China. It is curiously marked with red, white, and black.

Doucet, Charles Camille, shärl kä mēl doo-sā, French dramatist: b. Paris 16 May 1812; d. there 1 April 1895. He became in 1853 a government official in the theatrical department; was elected to the Academy in 1876, and soon after made its standing secretary. The best known of his many very successful comedies are: 'A Young Man' (1841); 'Lawyer in His Own Cause' (1842); 'Forbidden Fruit' (1857); 'Consideration.' His lyric pieces for the stage, 'Velasquez' (1847), and 'Antonio's Barque' (1849), were crowned by the Academy.

Doucet, Henri Lucien, ŏn-rē lü-sē-ŏn, French painter: b. Paris 23 Aug. 1856. He was a pupil of Lefebvre and Boulanger; and won the Prix de Rome in 1880. Among his paintings are: 'Adam and Eve'; 'Atala'; 'Après le Bal'; 'Hagar'; and a number of portraits, including one of Mme. Galli Marie of the Opéra Comique.

Doudney, Sarah, English novelist: b. Portsmouth 15 Jan. 1843. She began writing when quite young and has published: 'A Woman's Glory' (1885); 'The Missing Rubies' (1886); 'When We Two Parted' (1887); 'Strangers Yet'; 'Stepping Stones'; 'The Strength of Her Youth'; 'Thy Heart's Desire'; 'Where Two Ways Meet'; 'Under False Colors'; 'Nothing but Leaves'; 'Miss Willowburn's Offer'; 'Where the Dew Falls in London' (1890); 'Through Pain to Peace' (1892); 'A Romance of Lincoln's Inn' (1894); 'Katherine's Keys' (1895); 'Pilgrims of the Night' (1896); 'A Cluster of Roses'; 'Lady Dye's Reparation' (1899); 'Silent Strings' (1900); 'Godiva Durleigh'; 'Child of the Precinct.'

Dougall, Lily, Canadian novelist: b. Montreal, Canada, 16 April 1858. She has published: 'Beggars All' (1891); 'What Necessity Knows' (1893); 'The Mermaid' (1895); 'The Madonna of a Day' (1896); 'A Dozen Ways of Love' (1897); 'The Mormon Prophet' (1898).

Dough'bird, a name given to several species of curlew (q.v.), but more especially to the Eskimo curlew (*Numenius borealis*).

Doughface, a nickname applied to northern politicians who were inclined to yield to the southern States in the antebellum agitation over States' rights and slavery. The term is traced back to 1820, when it was applied to the Northerners who supported the Missouri Compromise (q.v.).

Doughty, Thomas, American landscape painter: b. Philadelphia 19 July 1793; d. New York 24 July 1856. He was apprenticed in his youth to a leather manufacturer, and afterward carried on the business on his own account. A growing taste for art, however, induced him to become a painter. He practised his profession for many years in the United States, and also in London and Paris.

Douglas, Scottish noble family. Their origin is unknown. They were already territorial magnates at the time when Bruce and Baliol were competitors for the crown, and like most of the Scottish nobility did homage and took oaths of allegiance to Edward I. They had estates both in England and Scotland, but chiefly in Scotland. One of them, William Douglas, joined Wallace. As their estates lay on the borders they early became guardians of the kingdom against the encroachments of the English, particularly of the Percies, who occupied a similar position on the English border, and acquired in this way power, habits, and experience which frequently made them formidable to the crown. The most important members of this family in chronological succession are:

JAMES, son of the William Douglas who had been a companion of Wallace, and is commonly known as the Good Sir James, early joined Bruce, and was one of his chief supporters throughout his career, and one of the most distinguished leaders at the battle of Bannockburn. He fell in battle with the Moors while on his way to the Holy Land with the heart of his master, in 1331.

ARCHIBALD, youngest brother of Sir James, succeeded to the regency of Scotland in the infancy of David. He was defeated and killed at Halidon Hill by Edward III. in 1333.

WILLIAM, son of the preceding, was created first earl in 1357. He recovered Douglasdale from the English, and was frequently engaged in wars with them. He fought at the battle of Poitiers. He died in 1384.

JAMES, the second earl, who, like his ancestors, was constantly engaged in border warfare, was killed at the battle of Otterburn in 1388. After his death the earldom passed to an illegitimate son of the Good Sir James, Archibald the Grim, Lord of Galloway.

ARCHIBALD, son of Archibald the Grim and fourth earl, was the Douglas who was defeated and taken prisoner by Percy (Hotspur) at Homildon, 14 Sept. 1402. He was also taken prisoner at Shrewsbury, 23 July 1403, and did not recover his liberty till 1407. He was killed at the battle of Verneuil, in Normandy, in 1427. Charles VII. created him Duke of Touraine, which title descended to his successors.

WILLIAM, sixth earl, b. 1422, together with his only brother, David, was assassinated by Crichton and Livingstone at a banquet to which he had been invited in the name of the king, in Edinburgh Castle, 24 Nov. 1440. Jealousy of the great power which the Douglases had acquired from their possessions in Scotland and France was the cause of this deed.

WILLIAM, the eighth earl, a descendant of the third earl, restored the power of the Douglases by a marriage with his cousin, heiress of another branch of the family; was appointed lord-lieutenant of the kingdom, and defeated the English at Sark. Latterly having entered into a treasonous league, he was invited by James II. to Stirling and there murdered by the king's own hand, 22 Feb. 1452.

JAMES, the ninth and last earl, brother of the preceding, took up arms with his allies to avenge his death, but was finally driven to England,

where he continued an exile for nearly 30 years. Having entered Scotland on a raid in 1484 he was taken prisoner and confined in the abbey of Lindores, where he died in 1488. His estates, which had been forfeited in 1455, were bestowed on the fourth Earl of Angus, the "Red Douglas," the representative of a younger branch of the Douglas family, which continued to flourish long after. The fifth Earl of Angus, Archibald Douglas, was the celebrated "Bell-the-Cat," one of whose sons was Gawin Douglas, the poet. He died in a monastery in 1514. Archibald, the sixth earl, married Queen Margaret, widow of James IV., attained the dignity of regent of the kingdom, and after various vicissitudes of fortune, having at one time been attainted and forced to flee from the kingdom, died about 1500. He left no son, and the title of Earl of Angus passed to his nephew, David. James Douglas, brother of David, married the heiress of the Earl of Morton, which title he received on the death of his father-in-law. His nephew, Archibald, eighth Earl of Angus and Earl of Morton, died childless, and the earldom of Angus then passed to Sir William Douglas of Glenbervie, his cousin, whose son William was raised to the rank of Marquis of Douglas. Archibald, the great-grandson of William, was raised in 1703 to the dignity of Duke of Douglas, but died unmarried in 1761, when the ducal title became extinct, and the marquisate passed to the Duke of Hamilton, the descendant of a younger son of the first marquis. The line of Angus or the Red Douglas is now represented by the houses of Hamilton and Home, who both claim the title of Earl of Angus.

Douglas, Alice May, American writer for young people: b. Bath, Maine, 28 June 1865. Her writings include in verse: 'Phlox'; 'May Flowers'; 'Gems Without Polish'; in prose: 'Jewel Gatherers'; 'The Peacemaker'; and 'Self-Exiled from Russia,' etc.

Douglas, Amanda Minnie, American author: b. in New York 14 July 1837. She has written about 30 novels besides doing other literary work. Among her novels are: 'In Trust'; 'Claudia'; 'Stephen Dane'; 'From Hand to Mouth'; 'Out of the Wreck'; 'A Woman's Inheritance'; 'Osborne of Arrochar' (1883); 'Her Place in the World' (1894). She has also written several juvenile tales.

Douglas, David, Scottish botanist: b. Scone, Perthshire, 1798; d. Hawaii 12 July 1834. In the botanical garden at Glasgow, he attracted the notice of Sir William Hooker, the professor of botany, who recommended him as a botanical collector to the Horticultural Society of London. He was accordingly, in 1823, sent by the society to the United States, where he procured many fine plants, and in particular increased the society's collection of fruit-trees. In 1824 he was sent on a second mission to explore the vegetation of the country adjoining the Columbia River, and southward toward California. In making the voyage he never lost sight of his object, and was able, during the short time the vessel touched at Rio Janeiro, to collect many rare orchidaceous plants and bulbs. He arrived at Fort Vancouver in 1825, 'and sent home, from time to time, many beautiful plants, with seeds and dried specimens. A species of pine of gigantic size, one of several which he discovered, bears his name, *Pinus Douglasii*.

Douglas, Gawin, Scottish poet: b. Brechin about 1474; d. London 1522. He was the son of Archibald, earl of Angus ("Bell-the-Cat"). Having taken orders in the church, he received the living of Prestonkirk, near Dunbar, and was also made provost of St. Giles, Edinburgh. In 1510 he was installed Bishop of Dunkeld, but had an uneasy tenure of office; and having gone to England, was deprived of his bishopric. Gawin Douglas' great work is a translation of the Æneid of Virgil (with the supplementary book of Maphæus) in heroic verse. It is executed with great spirit, and considering the age, with extraordinary elegance of diction. It was written about 1512, and is said to have been completed in 18 months. To each book is prefixed a highly poetical prologue. It was first published in 1553. Douglas also wrote 'The Palace of Honor' and 'King Hart,' both allegorical poems. A complete edition of his poems was published 1874.

Douglas, Henry Kyd, American author and jurist: b. Shepherdstown, W. Va., 29 Sept. 1840; d. Hagerstown, Md., 18 Dec. 1903. He was graduated at Franklin and Marshall College (1859), at the time when James Buchanan, afterward President of the United States, was a member of the faculty. He enlisted at Harper's Ferry in the Confederate Army as a private in Company B of the noted "Stonewall" Jackson Brigade. He took part in the battle of Bull Run, and for his bravery was promoted until he rose to be a captain. In March 1862 he made a ride of 103 miles in order that Gen. Ewell might at once join Jackson. This ride became celebrated in history. Horses were changed five times, and the ride was made through rain and mud. On his return he was promoted to inspector-general by Stonewall Jackson, with whom he served in every battle. At Gettysburg he was seriously wounded and was in prison nine months. His brigade was the last to surrender. Douglas was wounded nine times.

Douglas, John, English prelate: b. Pittenweem, Fifeshire, Scotland, 14 July 1721; d. Salisbury, England, 18 May 1807. He was educated at Oxford and in 1762 he was made Canon of Windsor, which benefice he exchanged for a residentiary canonry of St. Paul's. In 1751 he wrote 'Milton Vindicated from the Charge of Plagiarism.' In 1777 he prepared for the press the journal of Captain Cook's second voyage, to which he prefixed a well-written introduction, and added notes. In 1778 he was elected a Fellow of the Royal and Antiquarian Societies; and in 1781 he edited the account of Capt. Cook's third voyage. In 1787 he was raised to the see of Carlisle, and in 1792 was made Bishop of Salisbury.

Douglas, Robert Kennaway, English librarian and educator: b. Otry Sainte Mary, Devon, 23 Oct. 1838. In 1873 became professor of Chinese at King's College, London. Among his publications are: 'Life of Li Hung Chang' (1895); 'China' (1899).

Douglas, Stephen Arnold, American politician: b. Brandon, Vt., 23 April 1813; d. Chicago, 11 June 1861. His father, a physician, died three months after his birth, and his mother was left with scanty means of support. At the age of 15 he apprenticed himself to a cabinet-maker and worked for two years at the latter's trade. Then, after a short term of study at the

Brandon Academy, he accompanied his mother, who had married again, to a new home, near Canandaigua, N. Y., where he finished his schooling at an excellent academy, and where he began the study of law. He was interested deeply in political questions, even in these years, attaching himself with ardor to the new party of Democracy which Gen. Jackson was then molding into form. In 1833 he left Canandaigua to seek a career in the West, and, after several months of ill-health and hardship, found employment for the winter in school-teaching at Winchester, Ill. In the spring of 1834 he was admitted to the Illinois bar and settled himself at Jacksonville, in that State. From that time his rapid rise to prominence was extraordinary, even among careers of ambition in the young West. Physically delicate and short in stature, his small body was so strikingly in contrast with the power massed in a big brain and exercised by an indomitable will that admiring Jacksonville promptly gave him the name of the "Little Giant," which clung to him through life. Almost at once he became the acknowledged leader of his party in the town. A winning personality, an elastic temper, a fearless and ardent spirit, unbounded self-confidence and surpassing energy of intellect and will, were qualities that carried him always to the place of command. Within a year from his settlement at Jacksonville he was prosecuting attorney for his district; within two years he was seated in the legislature of the State; and from his service of a session in that body he passed into the office of United States Register of Public Lands, at Springfield, to which he was appointed by President Van Buren in 1837. His residence was at Springfield for the next 10 years, and there he came to acquaintance with Abraham Lincoln, his great political antagonist of a later time, whose rise to eminence was much slower than his own. In 1838 the bold young Jacksonian very nearly won an election to Congress in the strongly Whig district to which Springfield belonged. In 1841 he was appointed to a judgeship in the supreme court of the State, but resigned his seat on the bench two years later, to present himself again as a candidate for Congress, and with success. At that time (1843) he had just passed his thirtieth year. Most newcomers in Congress, even the ablest, need time to make a position of influence for themselves; but Douglas was prominent among the Democratic representatives of the Northwest from the first. The vigorous activity of his mind and the remarkable quickness of its working, made him formidable in debate; while the unhesitating resoluteness with which he threw himself into whatever he undertook carried him always to the front of the fighting line. At the beginning of his second term in the House of Representatives he was made chairman of its Committee on Territories; and when, at the end of that term, he was elected to the Senate (1845), he received the chairmanship of the same committee in that body. This gave him the direction of subjects in legislation which events were making more important and more exciting than any others in the politics of the time. Texas had just been annexed; the country was on the eve of a war of conquest with Mexico, and Great Britain was negotiating a fair settlement of the Oregon dispute. Should an expansion of national territory mean expansion of slavery, and, if so, to what extent? were the questions now rising in angry debate. They were brought into Congress by the famous resolution called the "Wilmot proviso," which declared that no slaves should be held in any territory acquired as the result of the Mexican War. Extremists on the pro-slavery side set up the opposing doctrine that slave-holding was a constitutional right in any territory, since slaves were a species of property recognized by the Constitution of the United States. A second ground of opposition to the Wilmot proviso was discovered, apparently first by Gen. Cass, who contended that the inhabitants of each territory should admit or exclude slavery as they pleased, by their own votes. This doctrine of "popular sovereignty," or "squatter sovereignty," as it was branded scornfully by Calhoun, commended itself to Douglas' mind. His attitude toward slavery was that of indifference to the right or wrong of the system, which he regarded confessedly as a problem in politics, and no more. Practically, the "squatter sovereignty" doctrine triumphed in the compromise measures of 1850, which admitted California to the Union under the free-state constitution that her people had framed, and organized New Mexico and Utah as territories with no restriction concerning slavery. Excepting Henry Clay, no one did more than Douglas in the framing of those measures and carrying them through. He was now so conspicuous among the chiefs of the Democratic party that he could aspire to its nomination for President in 1852. From the North he received strong support; but the less known and more pliant Franklin Pierce was preferred at the South. Douglas, not yet forty years of age, could afford to wait. At some time within the next two years he conceived his project for a more complete and final settlement of the slavery question than the compromise of 1850 had brought about. This, in his view, could be accomplished by a frank and full adoption of the principle of "popular sovereignty," applied to the whole national domain. Accordingly, in 1854, he startled the country by reporting from his committee what was known in its final form as the Kansas-Nebraska Bill, repealing the Missouri Compromise of 1820 (which excluded slavery from the territory of the Louisiana Purchase, north of 36° 30′) and leaving "the inhabitants thereof perfectly free to form and regulate their domestic institutions in their own way." At the North the bill raised a storm which even the bold spirit of Douglas must have watched with alarm. His own party was torn by it; that of the Whigs had already gone to pieces, and two new parties, "Know Nothing" or American, and Republican, now emerged from what seemed to be a general wreck of all in politics that belonged to the past. But Douglas, with no sign of faltering, fought a wonderful battle for his bill and carried it through. Then came the test in practice of his policy, applied in a struggle between anti-slavery and pro-slavery forces to control the settlement and the constitution-making of Kansas. The test was not favorable to the prestige of Douglas. He had heated instead of cooling the agitation of the slavery question, and made it more dangerous than before. As a candidate for the presidency he was hardly so strong in 1856 as in 1852; but after Buchanan, then elected, had driven Douglas to revolt, by countenancing the

fraud of the Lecompton Constitution, making a farce of "popular sovereignty" in Kansas, the manly course of the Illinois Senator gave him more of popularity in the free States than he lost in the South. The hostility of the administration, combining with the opposition of the new Republican party, already powerful in the Northwest, could not defeat his re-election to the Senate in 1858. Over any antagonist but Lincoln he would probably have won a great triumph; as it was, he came wounded from his debates with that extraordinary man. He had been forced to declarations that offended his party in one section of the country more than they satisfied it in the other, and made him the occasion of a hopeless breach between the two. Nominated, for President, at last, in 1860, by one wing of a divided party, he fought his last political battle, with all of his old obstinate valor, and went down in defeat. He was at the end of the small gift of bodily strength that he received at his birth; he had worn it out. He survived the election of Lincoln only long enough to stretch a loyal and supporting hand to his successful rival, in the crisis of rebellion that ensued. His last words to his followers were: "There can be no neutrals in this war."

J. N. LARNED,
Author of the History for Ready Reference.

Douglas, Sir William Fettes, Scottish painter: b. Edinburgh 29 March 1822; d. 20 July 1891. As a painter he was mainly self-taught. On first devoting himself to art he practised chiefly as a landscape painter, but he soon turned to figure subjects, producing 'Hudibras and Ralph visiting the Astrologer' (1856); 'Lovel and the Antiquary' (1857); 'The Summons to the Secret Tribunal' (1860); and 'The Magic Mirror' (1872); works distinguished by excellent coloring, and by especially firm, careful, and refined handling. His later years were entirely devoted to landscape water-colors. He is represented in the National Gallery of Scotland by 'The Messenger of Evil Tidings'; 'The Spell'; and 'The Bibliophilist.'

Douglas, England, capital of the Isle of Man, and a popular summer resort. Pop. 20,305.

Douglas Fir. See FIR.

Douglass, Andrew Ellicott, American archæologist: b. West Point, N. Y., 18 Nov. 1819; d. New York 30 Sept. 1901. He was graduated at Kenyon College in 1838, and after a business career of many years with the Hazard Powder Company, of which he became the president in 1867, he retired in 1876, and spent 10 winters on the coast of Florida, excavating Indian mounds, and collecting specimens of archæological interest to the number of 22,000, which may be seen in the American Museum of Natural History, New York. He is a member of many scientific societies, including the Société d'Anthropologie of Paris.

Douglass, David Bates, American civil and military engineer: b. Pompton, N. J., 21 March 1700; d. Geneva, N. Y., 9 Oct. 1849. He was graduated from Yale in 1813 and served in the engineer corps of 1813–31. He was one of the engineers of the Croton Aqueduct (1833–35), president of Kenyon College (1840–44), and professor of mathematics in Hobart College the last year of his life.

Douglass, Frederick, American lecturer and journalist, the son of a negro slave: b. Tuckahoe, Md., Feb. 1817; d. Washington, D. C., 20 Feb. 1895. Although his father was a white man, he was, according to the law, reared as a slave. In 1832 he was purchased by a Baltimore shipbuilder, but made his escape in 1838. As he had taught himself to read and write, and showed talent as an orator, he was employed by the Anti-Slavery Society as one of their lecturers. In 1845 he published his 'Autobiography,' and afterward made a successful lecturing tour in England. In 1870 he started a journal entitled 'The New National Era'; in 1871 he was appointed secretary of the commission to Santo Domingo; in 1872, presidential elector; in 1877, marshal for the District of Columbia, then commissioner of deeds for that district, and in 1889, United States minister to Haiti.

Doukhobors, doo'hō-bōrz (Russian *dukhobortsy*, "spirit wrestlers," from their vanquishing the doctrine of the Holy Spirit), a sect which started in Kharkov, Russia, about 1740, and spread rapidly in the Dnieper provinces. The founder's name is not preserved: he was a Prussian sub-officer who settled in Russia when his term expired. He and his successors, Kolesnikoff, Kapustin, etc., taught the familiar doctrine of the "inner light," with logical but socially inconvenient extensions: that as God in the soul is the one guide to action, the Bible is not inspired (though they accept the Ten Commandments), and it is not only superfluous but sinful to read and write, printing being a snare of the Devil; that God manifests himself in the fullest power in the human soul, and as they had that power, they were embodiments of God, and to be worshipped and obeyed as such; that Christ was only a sinless man, and the sinless leaders were his equals and successors. Every one's action being dictated by God, it cannot be wrong, and civil rulers are needless and their rule a usurpation; all being equal before God, churches are needless and they do not enter them; marriages need neither ceremonies nor permission, being of inclination only. It is easy to see that these tenets brought them in conflict with the authorities, who tried to restrict them to theory instead of practice, and imprisoned numbers for contumacy; but in 1801 a commissioner's report to Alexander I. that they were well-behaved citizens induced him to order them left alone. It worked so ill, from insubordination and social evils, that in 1819 the same Czar again authorized the sharpest punishments. At length, on their petition for a grant of waste lands where they could live their chosen life undisturbing and undisturbed, they were settled on the fertile banks of the Molochnaya, on the north shore of the Sea of Azov. Thus left alone, the leaders and their satellites embarked on a carnival of lust, avarice, and despotism; no woman nor piece of property was safe from them, nor any man's life who protested (a minutely exact parallel to an American case in similar conditions), and bands of maranders went about stealing whatever their employers liked. The report of an imperial commission was so shocking that in 1833–7 they were deported to the then wilderness of Transcaucasia; a high bleak plateau unfit for agriculture, where they became almost wholly cattle-raisers and -eaters, and increased to some

15,000. The government gradually put down the civil despotism of the leaders, and enforced decency of life; but it was not done without much petty tyranny, and doubtless corruption and abuse, of which they complained. Then came Pobiedonostseff's policy of unifying the elements of the empire, and enforcing conformity to the Greek Church; and in 1887 a bitter faction fight between two pretenders to the Doukhobor leadership rent the community. One section decided to emigrate to be rid of it all; and finally obtaining permission and negotiating successfully with other governments, a few went to Cyprus, while in 1899 a band of 2,000, under a son of Count Tolstoi, settled on lands granted them in Manitoba. The next year 5,000 more were located there and in the Northwest Territories. They would not take lands in severalty, but only in communities; but they were prospering and learning English, filling the schools with their children, and appearing to slough off their unassimilable characteristics. Suddenly they adopted the tenet that all use of animals or their products for human service is sinful, and refused to eat milk, butter, or eggs, wear woolen or leather garments, or use draft animals. Then one settlement refused to pay school taxes, till the government seized and sold their cattle. In the summer of 1902 they all at once turned their stock loose on the prairies and began hauling their own loads to market, sometimes 50 miles off, and themselves drawing the plows; the government rounded up the stock, sold it, and placed the proceeds to the credit of the communities. While crippled in power to work for lack of animals, the rumor spread that Jesus was shortly to appear at Winnipeg, 300 miles east, to lead them to a new kingdom; they deserted the villages, and on the night of 27 Oct., 1,500 to 2,000 set off across country. After dreadful sufferings from cold and hunger, and joined by thousands more, men, women, and children, they came near Yorkton 10 days after, and lay out in the fields with the thermometer at 22°. The police singled out the women and children and the sick, and locked them into comfortable quarters; several hundred of the men went on alone, the women clamoring to accompany them and some going insane. When about 100 miles from Winnipeg, the mounted police forced them into freight cars and took them back to their villages. These antic seizures make it probable that the persecutions of the Russian government were not wholly without excuse or humane intent.

Doulton, Sir Henry, English potter: b. Lambeth 21 July 1820; d. 19 Nov. 1897. At 15 he entered his father's establishment there, where he devoted himself to the most technical branch of the industry, and worked for many years at the potter's wheel. In 1846 he commenced the manufacture of stoneware pipes for sewage and drainage, for which a special factory was erected near Lambeth Palace, and thus initiated the substitution of impervious pipes for the old flat-bottomed brick drains. Sir Henry Doulton, however, is chiefly noteworthy as having been mainly instrumental in bringing about the revival in art pottery which has since spread into every civilized country; and his firm's works in art stoneware, silicon, impasto, terra-cotta, faience, and Doulton wares, have since 1870 gained the highest awards of judges at every exhibition of note throughout the world. He was created a Chevalier of the Legion of Honor (1878); was awarded the Albert medal in 1885; and in 1887 was knighted on the occasion of the queen's jubilee. See Pottery.

Doune, Scotland, village of Perthshire, on the Teith, nine miles from Stirling. Doune Castle, now a ruin, is described in Scott's 'Waverley'. Pop. 1,200. At Deanston, a mile west, are large cotton-mills, long managed by James Smith, a noted inventor and philanthropist.

Douro, dō'roo, or **Duero,** doo-a'rō (ancient Durius), one of the largest rivers of the Spanish Peninsula, which, flowing west, traverses about one half of Spain and the whole of Portugal, and, after a course of 500 miles, flows into the Atlantic three miles below Oporto. It is not of much navigable importance, but small vessels ascend about 70 miles from its mouth. In the Middle Ages it was celebrated for the gold that was found in its bed.

Douroucouli, doo-roo-koo'lē, a small Brazilian monkey, of nocturnal habits, which sleeps by day, and preys fiercely by night upon insects and small birds. It is of the genus *Nyctipithecus*, of which various species are known, all South American. They are about nine inches long, with tails somewhat longer than their bodies; and have soft grayish fur; their voices are discordant and disagreeable. They are known also as "owl-monkeys," and "night-monkeys."

Dousa, Janus (Latinized from Jan Van der Does), Dutch statesman, philologist, historian, and poet: b. Noordwyk, Holland, 6 Dec. 1545; d. there October 1604. In 1572 he went as ambassador to England to obtain the support of Queen Elizabeth for the cause of the Dutch. As chief commander, during the siege of Leyden by the Spaniards, he conducted himself with prudence and courage in the midst of the horrors of famine, plague, and civil dissensions. He kept up an intercourse with the expected deliverers by means of trained pigeons; and to these faithful messengers he has expressed his gratitude in some of his poems. The stadtholder, William I., compensated the city for its sufferings by the establishment of the university, of which Dousa was the first curator. His best-known work is 'Bataviæ Hollandiæque Annales' (1599).

Douw, Gerard. See Dow, Gerard.

Douzette, dow'zĕt, **Louis,** German painter: b. Triebsees, Pomerania, 25 Sept. 1834. He received a gold medal at Berlin in 1886. He is a landscape painter almost exclusively, and is particularly noted for his moonlight effects. His 'Moonlight on the Fjord' is in the Dresden gallery.

Dovalle, Charles, shärl dō-väl, French poet: b. Montreuil-Bellay 23 June 1807; d. 30 Nov. 1829. He was a poor provincial who came to Paris unknown, studied law, and burst on the literary world with 'The Oratory in the Garden,' and other delightful poems of a like nature, besides an 'Ode on Liberty.' His promising career was closed at 22 in a duel, the challenger being enraged at a literary criticism.

Dove, Heinrich Wilhelm, hīn'rĭh vil'hĕlm dō'vĕ, German physicist and meteorologist: b. Liegnitz 6 Oct. 1803; d. Berlin 4 April 1379.

He was educated at Breslau and Berlin, and in 1845 he was appointed professor of natural philosophy at the university of the latter city, a post which he held till his death. Among his works are 'Meteorological Researches' (1837); 'Distribution of Heat on the Surface of the Globe' (1852); 'Law of Storms' (1857); 'Optical Studies' (1859), and many papers in various journals.

Dove, Patrick Edward, Scottish economist, b. Lasswade 1812; d. Cape Town, Cape Colony, 1870. He was graduated at Aberdeen and studied at Heidelberg, achieving fame with 'The Theory of Human Progression' (1850), from which Henry George was accused of stealing the "single tax" idea. Dove wrote also: 'Science of Politics.'

Dove, a river in England, a tributary of the Trent, has its rise in the hills of the Peak of Derbyshire. It was the favorite fishing stream of Izaak Walton, who lived near with his friend, Charles Cotton; and it is still beloved of anglers.

Dove, originally applied in England to several native and domesticated species of the genus *Columba;* the name dove is now used generally for the smaller species of the pigeon family (*Columbidæ,* q.v.), but in many cases interchangeably with pigeon. The name applies to about 10 native North American species, of which the most important are the mourning dove (*Zenaidura macroura*); the white-winged dove (*Melopelia leucoptera*); the ground dove (*Columbigallina passerina*), and several species of ground dove, of which only the first extends its range northward, the others being more especially derived from the West Indian and Mexican fauna, which includes many additional species. The mourning dove, so-called on account of its plaintive call, and unadorned plumage, ranges and breeds throughout temperate North America. The nest is a loose structure of twigs in which two eggs are deposited. In the late summer and autumn, when congregated in small flocks, doves are sometimes destructive to crops, and are much sought by gunners in localities where the game laws permit.

Several species of European and other exotic doves are well-known in this country in the domesticated state. The ring dove (*Columba palumbus*) occurs throughout Europe, collecting in large flocks during the winter and depredating fields of turnips and other crops. The rock dove, or rock pigeon (*C. livia*), is considered by Darwin ('Animals and Plants Under Domestication') to have been the original stock of our domesticated pigeons, which, as a result of careful selection, have diverged into many races, arranged by Darwin in four principal groups: (1) Pouters; (2) Carriers, Runts, and Barbs; (3) Fantails, Tumblers, Turbits, etc.; and (4) Trumpeters—which lead through some little modified varieties to the original stock still existing on the coasts of Europe and North Africa.

The turtle dove (*Turtur communis*), of Europe has been universally adopted in Christian countries as the emblem of gentleness and love, and figures much in poetry. The dove was the bird of Venus. Babylon was the city of the dove; it was a dove that whispered into the ear of Mohammed, and was his oracle. The dove was a sacred bird to the Israelites, and Jerusalem was the city of the dove. In Christian times it was the attribute of the Virgin Mary; was a symbol of the Holy Ghost, and carved on the tombs of martyrs as a figure of the resurrection.

Dove, The, one of two vessels which in 1633 sailed from Cowes, England, for Maryland with a company of colonists under Leonard Calvert. The other vessel was named The Ark. After a four months' voyage they landed on St. Clement's Island in the Potomac River.

Dove-plant, or **Holy Ghost Plant,** an orchid of Central America, much reverenced by the pious natives because of its resemblance to a dove with outstretched wings, the symbol of the Holy Ghost; called also Holy-Spirit flower.

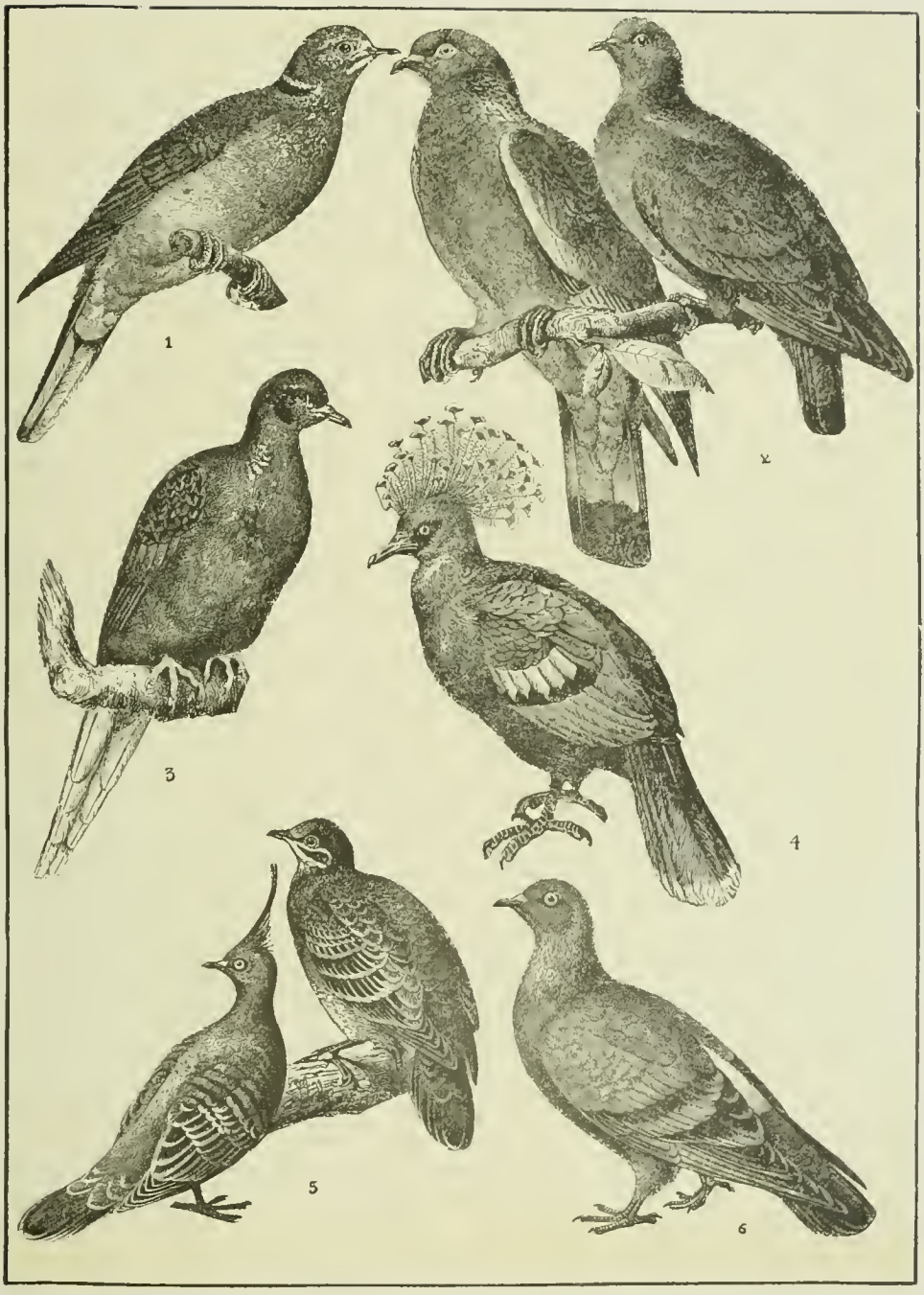
Dove-tick, a bird parasite (*Argas reflexus*), the blind tick which infests doves and other birds. Some of the species are said to cause death by their sting. See Tick.

Dovekie, dŭv'kĭ, the little auk (*Alle alle*), one of the smallest of the family *Alcidæ,* a bird of high northern latitudes, living and breeding gregariously, on rocky sea-coasts of the North Atlantic and Arctic oceans. A single egg is laid by this bird on the bare rock. In winter, it is found along the coast of New England and the Middle States, and is occasionally blown by storms as far inland as Michigan. The dovekie, or sea dove, as it is also sometimes designated, is from eight to nine inches long; of a glossy blue-black above, with the under parts, and two patches on each wing, white. The adults have a small crest on the base of the beak.

The name is also sometimes applied by fishermen to one or more species of guillemot.

Do'ver, Del., city, capital of the State and county-seat of Kent County; on Jones creek, and the Philadelphia, W. & B. R.R., 75 miles south of Philadelphia. It is the seat of Wilmington Conference Academy and has a handsome monument erected to the memory of Cæsar Rodney, one of the signers of the Declaration of Independence. It is the centre of a great fruit-growing region. It is on high ground; is laid out with wide, straight streets that cross each other at right angles; and is built up chiefly with brick. Among its noteworthy buildings are a handsome State house, large courthouse, and new United States government building. Connected with the State house is a State library with upward of 50,000 volumes. There are several churches, a national and a State bank, fruit evaporating and packing establishments, steam flour-mill, foundry, machine shop, and sash, fruit crate, glass, and carriage factories. The city has valuable gas and water works, weekly newspapers, and good schools. Pop. 3,329.

Dover, England, a Cinque port and parliamentary and municipal borough in the east of Kent, England, 66 miles east-southeast of London. It is the headquarters of the Southeastern District of the British Army, and the nearest point of the English coast to France. The fortifications comprise Dover Castle, which occupies a commanding position on the chalk cliffs, 375 feet above the level of the sea, and still includes some of the old Saxon and Norman work; Fort Burgoyne on the north side of the town; Archcliffe Fort to the west, and the



1. Domestic Turtle-dove (Turtur risorious).
2. European Wood-pigeon (Columba palumbus) at the left; and Stock-dove (C. ænas) at the right.
3. American Wild or Passenger Pigeon (Ectopistes migratorius).
4. Papuan Crowned Pigeon (Goura albertisi)
5. Crested and Common Australian Bronze winged Doves.
6. Blue Rock-dove (Columbia livia).

batteries on the Western Heights, where large barracks are situated. Pop. 35,000.

Dover, N. H., city, county-seat of Strafford County; on Cocheco River, and the Boston & M. R.R.; 168 miles north-northeast of Boston. It is situated on hilly ground, is regularly laid out, and has many handsome buildings and residences. The Falls of Cocheco, within the city limits, are the source of abundant water power. Dover's industries include several large cotton- and woolen-mills; an extensive print works, with a capacity of over 30,000,000 yards annually; manufactories of boots and shoes, oil cloth, hats and caps, sandpaper and glue; and several tanneries, brass- and iron-foundries, and machine shops. There are several churches; about 40 public schools, high school, St. Joseph's Hill School, Franklin Academy; a national bank; several savings banks; daily and weekly newspapers; electric lights, and street railways. It is the oldest city in the State; was settled in 1623; nearly destroyed by the Indians in 1689; and was chartered as a city in 1855. Pop. (1900) 13,207.

Dover, N. J., city in Morris County, on the Rockaway River, the Lackawanna, and the New Jersey C. R.R.'s, and the Morris and Essex Canal; 28 miles west of Newark. It has extensive iron interests, railroad shops, machine shops, furnace and stove factories, and silk and hosiery mills. Five miles distant is a government powder magazine. Nearby are Lake Hopatcong, Mt. Arlington, Budd's Lake, and Schooley's Mountain, all noted summer resorts. The city has a high school, several churches, business college, daily and weekly newspapers, electric lights, and a national bank. Pop. 6,000.

Dover, Tenn., town, county-seat of Stewart County; on the Cumberland River, near Fort Donelson (q.v.). It is an insignificant village of less than 500 inhabitants, but is noteworthy as containing a national cemetery, where 672 soldiers of the Civil War are buried.

Dover, Strait of, the narrow channel which connects the North Sea with the English Channel, and separates England and France. At the narrowest part it is only 21 miles wide. The depth of the channel at a medium in the highest spring tides is about 180 feet. On both the French and English sides the chalky cliffs show a correspondency of strata which leaves no room for doubt that they were once united. Various projects for connecting Dover and Calais more closely have been advanced, as by bridge or tunnel or by trains on submerged rails. When making examinations for the tunnel scheme, coal was discovered in the bed of the Strait.

Dover's Powder was first prescribed by Thomas Dover, M.D. (1660–1742). The powder is prepared by mixing powdered ipecacuanha root, 1 part; powdered opium, 1 part; and sulphate of potash, 8 parts. The whole is thoroughly mixed, and the ordinary dose is from 5 to 10 grains. Occasionally, saltpetre is added. It is a most valuable medicine, and acts as a sudorific, increasing the proportion of sweat or sensible perspiration. As a "home remedy" for warding off a cold it is considered invaluable. Three or four grains will often relieve an attack of heartburn.

Dovetail, a term used in carpentry; the fastening of boards together by letting one piece into another, in the form of the tail of a dove. The dovetail is the strongest of jointings, because the tenon, or piece of wood which is put into the other, goes widening to the end, so that it cannot be drawn out again. Dovetails are either exposed or concealed; the latter being of two kinds, lapped and mitred. There is also a dovetail hinge, dovetail saw, dovetail file and in Roman architecture an ornamented molding in the form of a dove's tail.

Doveton, Frederick Bazett, English author: b. Exeter 1841. He has published 'Snatches of Song' (1880); 'Sketches in Prose and Verse' (1886); 'Maggie on Mythica: a Fairy Tale' (1890); 'Songs Grave and Gay' (1893); 'A Fisherman's Fancies' (1895); 'Mirth and Music' (1901).

Dovizio, Bernardo, bĕr-när'dō dō-vē'tsē-ō. See BIBBIENA.

Dovre-fjeld, dŏv-rĕ-fyĕl', or **Doerines,** an assemblage of mountain masses, Norway, forming the central part of the Scandinavian system, and extending east-northeast from lat. 62° N., where the Langfield terminates, to lat. 63°, where the Koelen begins. It is generally composed of gneiss and mica-schist, and its highest summit is Snehaetten, 7,620 feet.

Dow, or Douw, Gerard, Dutch painter: b. Leyden 7 April 1613; d. there Feb. 1675. He studied under Rembrandt, and was distinguished for the excellence of his coloring and *chiaroscuro.* He surpassed his master in diligence, and nothing can be more finished than his small pieces, which are so delicate that a magnifying-glass is necessary to see distinctly the work in them. His softest figures are full of life, and he never neglected, in his representations, the almost invisible minutiæ of nature. He is regarded as the inventor of the ingenious mode of painting large pictures on a reduced scale, by covering the original with a frame, including a space divided into small quadrangular parts by means of threads, and then transferring the parts into an equal number of similar divisions, drawn on the canvas. He made use of the convex mirror to represent objects on a reduced scale. His works are still among the dearest of the Dutch school. His picture of 'The Fish Merchant' when sold in 1883 brought about $10,000.

Dow, Lorenzo, American preacher: b. Coventry, Conn., 16 Oct. 1777; d. Georgetown, D. C., 2 Feb. 1834. Adopting the doctrines of the Methodists, 1796, he finally received a regular license to preach, and, in spite of contumely and rebuffs, and ceaseless hardships and dangers of all kinds, persevered for nearly 40 years, with an enthusiasm which never relaxed, and often with astonishing effect. In the course of his ministry he traveled over many parts of the United States and Canada, and in 1799 and again in 1805 visited England and Ireland, where his peculiar eloquence attracted much attention and on several occasions subjected him to persecution. Dow's eccentricity of manner and dress for a long time excited a prejudice against him, and in many parts of the country he was familiarly known as "crazy Dow." But to the class whom he most frequently addressed, his simple fervor, though coupled with illiterate phrase-

ology, supplied the place of eloquence, and he seldom failed of having attentive hearers. His journal, containing the history of his life to his 40th year, together with some of his miscellaneous writings, was published in 1856.

Dow, Neal, American temperance reformer: b. Portland, Me., 20 March 1804; d. 2 Oct. 1897. He was the author of the bill which prohibited the manufacture and sale of intoxicating liquors in the State of Maine, widely known as the "Maine Law." During the Civil War he was colonel of a Maine regiment and a brigadier-general of volunteers. In 1880 he was the Prohibitionist candidate for the Presidency.

Dowd, Charles Ferdinand, American educator: b. Madison, Conn., 25 April 1825; d. Saratoga, N. Y., 12 Nov. 1904. He was graduated at Yale in 1853, and for many years was principal of Temple Grove Seminary at Saratoga. He originated the idea of longitude standards for railroad time, and advocated the 24-hour time notation.

Dow'den, Edward, English literary critic and historian: b. Cork, Ireland, 3 May, 1843. He was educated at Queen's College, Cork, and Trinity College, Dublin, and 1867 was elected to the professorship of English Literature in the latter institution, a post he still holds. Besides many valuable articles in periodicals he has published many works on literary subjects, of which the most important are 'Shakspere: His Mind and Art' (1875); 'Poems' (1876); 'Shakspere Primer' (1877); 'Studies in Literature' (1878); 'Southey' (1880); 'Life of Shelley' (1886), the chief authority on the poet's life, being founded on papers in the possession of the Shelley family; 'Transcripts and Studies' (1888); 'Introduction to Shakspere' (1893); 'New Studies in Literature' (1895); 'The French Revolution and English Literature' (1897); 'History of French Literature' (1897); 'Puritan and Anglican' (1900). He has also edited editions of Shelley, Wordsworth, etc. In 1896 he lectured in the United States.

Dowden, John, Scottish prelate: b. Cork, Ireland, 29 June 1840. He is a brother of E. Dowden (q.v.) He was educated at Queen's College, Cork, and Trinity College, Dublin, and taking orders in the Scottish Episcopal Church became Bishop of Edinburgh in 1886. He has published 'The Annotated Scottish Communion Office'; 'The Celtic Church in Scotland'; 'History of the Theological Literature of the Church of England'; 'The Workmanship of the Prayer Book.'

Dower, the estate for life which a widow acquires in a certain portion of her husband's real property after his death. Dower, by the common law of the United States, entitles the widow to a third part of all the lands and tenements of which the husband was seized in fee simple, at any time during the coverture; but the rule varies widely on many particulars in the different States. Tenancy in dower is where a widow takes a third of such lands and tenements of which her husband dies possessed, and in which her title to dower has not been previously barred. Some have ascribed dower to the Normans, but it was first introduced into the feudal system by the German Emperor Frederick II., who was contemporary with Henry III. of England. The person endowed must be the actual wife of the party at the time of his decease. If she be divorced *a vinculo* she shall not be endowed; but a judicial separation does not destroy the dower.

Dowie, John Alexander, American leader of a religious sect: b. Edinburgh, Scotland, 1847. He studied for the ministry, and held two pastorates in Sidney, Australia, but subsequently became an evangelist preacher. While in Australia he organized the International Divine Healing Association of which he became president. In behalf of this association he traveled in England and America, and finally settled in Chicago in 1890. Here he built his wooden "tabernacle" in Woodlawn, which was opened in 1893, and attracted large crowds by his preaching and faith cures. He later organized the Christian Catholic Church in Zion, which grew rapidly, adding many auxiliary lines of work, such as a college for Zion preachers, a training school for deaconesses, and a number of charitable institutions. Dowie had already established a publishing house, which became a part of the organization, and had full control of a bank, known as the Zion bank. He finally organized a land association, and purchased a large tract of land on the shores of Lake Michigan, where he and his devotees are building Zion City, the centre of all the numerous activities of the Christian Catholic Church; here he has also established a lace industry. In this city he is practically dictator, forbids smoking, drinking, card playing, etc., and oversees all branches of the work. He also preaches frequently, and gives special attention to the healing of the sick. In 1901 he made the claim of being "Elijah the Restorer." In 1903 he built the new tabernacle at Zion City, near Chicago, Ill., which he claims is the largest building in the United States devoted exclusively to the worship of God.

Consult Buckley, 'Dowie Analyzed and Classified' ('Century Magazine,' Vol. LXIV., pages 928–32); Napes, 'John Alexander Dowie and his Zions'; ('Independent,' Vol. LIII. p. 1786–91); Swain, 'John Alexander Dowie' ('Century Magazine,' Vol. LXIV. p. 933–44).

Dowitcher, dow'ich-ėr, a sporting name for birds of the genus *Macrorhampus*, which are related to the snipes, and are much hunted along the beaches of this country, during the season. Two species, breeding far north, winter in South America and Mexico. The birds are from 10 to 12 inches long, with a bill nearly one fourth the length of the body. The upper parts are dark, while the under feathers are reddish.

Dow'las, a kind of coarse linen, very commonly worn by the lower classes in the 16th century; also a strong calico made in imitation of the linen fabric. The name is said to be derived from Doullens, a town in the department of Somme, France. Before the introduction of machine-woven cotton cloth, dowlas was manufactured largely in Yorkshire, England, and in the south of Scotland.

Dowler, Bennett, American physician: b. Moundsville, Va., 16 April 1797; d. New Orleans 1879. He graduated from the University of Maryland, and settling in New Orleans founded the New Orleans Academy of Sciences, and was for a number of years editor of the

'Medical and Surgical Journal.' He made a number of experiments with the human body immediately after death, resulting in important discoveries in regard to capillary circulation, contractibility, etc., and also investigated the subject of animal heat. He wrote 'Tableau of the Yellow Fever of 1853' (1854).

Dowletabad, dow-lē-ta-bäd', or **Daulatabad,** India, one of the most remarkable fortresses of India, in the Nizam's Dominions (Haidarabad), 10 miles northwest of Aurangabad. The strong part of it consists of an isolated rock or mass of granite, 500 or 600 feet high, and forming, for about 150 feet, a mural precipice. The only access to the small platform on the summit, is through a low excavation in the heart of the rock. There is a ditch and other works round the base of the rock.

Down, county of Ireland, in the province of Ulster; area 610,730 acres. It possesses good agricultural land, and is rich in minerals. Pop. 289,335.

Downes, William Howe, American journalist art critic: b. Danbury, Conn., 1 March 1854. He has been a staff writer on the Boston *Transcript* for many years. He has published 'Spanish Ways and By-ways'; 'The Tin Army of the Potomac'; 'Arcadian Days'; 'Twelve Great Artists'; and written many papers on art matters for various magazines.

Downfall, The ("La Débâcle"), a novel of the Franco-Prussian war, by Émile Zola, published in 1892. The siege of Sedan forms the dramatic centre of the story, which is concerned chiefly with the friendship of Macquart and Levasseur, and the love of Macquart and Levasseur's sister Henriette.

Downing, Andrew Jackson, American landscape gardener: b. Newburg, N. Y., 20 Oct. 1815; d. near Yonkers, N. Y., 28 July 1852. His 'Landscape Gardening and Rural Architecture' (1841); 'Cottage Residences' (1842); 'Fruits and Fruit Trees of America' (1845); were long considered authorities on the subjects of which they treat.

Downing, Charles, American horticulturist: b. Newburg, N. Y., 9 July 1802; d. there 18 Jan. 1885. In 1837 he established a nursery near the city of Newburg, and remained in the business for 30 years. His experiments resulted in the improvement of many varieties of fruit, and he was regarded as an authority on horticulture and fruit growing. In the later years of his life he contributed articles to various periodicals, and revised and greatly enlarged 'Fruits and Fruit Trees of America,' written by his brother, A. J. Downing (q.v.).

Downing, Fanny Murdaugh, American author: b. Portsmouth, Va., about 1835; d. 1894. She was the author of the novels 'Nameless' (1865), and 'Perfect through Suffering'; and the poems 'The Legend of Catawba' and 'Dixie' (1867).

Downing, R. F., American customs broker and shipper: b. New York 5 May 1849; d. Brooklyn, N. Y., 30 April 1903. He founded the brokerage and shipping firm of R. F. Downing & Co. and with each alteration in the tariff law published the work known as 'Downing's Customs Tariff.'

Downing College, one of the colleges of the University of Cambridge, chartered in 1800 and opened in 1821. Its founder was Sir George Downing, a Cambridgeshire gentleman, grandson of the politician after whom Downing Street in London was named. The objects of the founder were but partially realized, as his legacy was wasted in costly litigation, and in 1903 less than one half of the contemplated quadrangle was completed and there were but few fellows and students.

Downing Street, a short street in Whitehall (named after Sir George Downing, secretary to the treasury in 1667), London, England, where are the colonial and foreign offices, with the official residence since 1735 of the first lord of the treasury. Here cabinet councils are held, hence the term is sometimes employed for the government in office.

Downs, hilly tracts of grassy land suited for pasture; especially two parallel ranges of grassy hills in the south of England, the North Downs running east to west from Hants through Surrey and Kent to Dover, the South Downs in Hants and Sussex, terminating at Beachy Head.

Downs, The, a celebrated roadstead for ships, extending six miles along the southeast coast of Kent, in England, between the North and the South Foreland, where outward and homeward bound ships frequently make some stay, and men-of-war often rendezvous in time of war. It affords excellent anchorage, and is sheltered by Goodwin Sands, but is open to the south. Deal, Dover and Sandown castles are its defense. An obstinate sea-fight took place here in 1666 between the English and Dutch.

Doxology, an ascription of praise to the Almighty: in particular the Greater Doxology (*Gloria in excelsis*, Glory to God in the highest) and the Lesser Doxology (*Gloria Patri et Filio*, etc., Glory be to the Father and the Son; etc.) The Greater Doxology, as is seen, opens with the words of the evangelist St. Luke when he recounts the circumstances attending the birth of Jesus at Bethlehem; the heavenly host chanting Glory to God in the highest, and on earth peace among men of good will. This Greater Doxology has a place in the Roman Catholic liturgy and in the communion service of the Anglican Church. Its introduction into the liturgy dates only from the time of Pope Symmachus (beginning of 6th century); previously it had been customary to recite it after the Mass. The Lesser Doxology had its origin apparently in the commission given to the Apostles (Matt. xxviii. 19) to teach all nations, baptizing them "in the name of the Father, Son, and Holy Spirit." An ancient form of this Doxology is "Glory to the Father in the Son," and that was considered to be consistent with orthodoxy till the Arians favored it as expressing their view of the relation of Jesus Christ to God the Father: then the orthodox rejected it and employed the other formula exclusively. In the Roman Catholic Breviary at the end of each of the psalms of the daily office the *Gloria Patri*, etc., is always pronounced. The latter portion of this doxology, "as it was in the beginning, is now, and ever shall be. Amen," was appended as a protest against certain hereties of the 6th century who denied the Son's eternity.

Doyen, Gabriel François, gäb-rē-ĕl frän-swä dwä-yäń, French painter: b. Paris 1726; d. St. Petersburg 5 June 1806. After study with Van Loo, he obtained the Grand Prix de

Rome, and spent many years in Italy. His 'Triumph of Amphitrite' is in the Louvre, and his 'Adoration of the Magi' in the museum at Darmstadt. Other noted productions are in various churches, but most famous production, 'Miracle des Ardes,' painted in 1707, being in that of Saint Roch, Paris.

Doyle, Sir Arthur Conan, English novelist: b. Edinburgh, Scotland, 22 May 1859. He is a nephew of Richard Doyle (q.v.). He was educated at the Roman Catholic college at Stonyhurst, Lancashire, and at the University of Edinburgh. After practising as a physician at Southsea (1882–90), the success of several of his books induced him to give up the profession for that of literature. He has published 'A Study in Scarlet' (1887); 'The Captain of the Polestar' (1888); 'Micah Clarke' (1888); 'The Sign of The Four' (1889); 'The White Company' (1890); 'The Firm of Girdlestone' (1890); 'The Adventures of Sherlock Holmes' (1891); a very popular series of detective stories; 'The Refugees' (1891); 'The Great Shadow' (1892); 'Memoirs of Sherlock Holmes' (1893); 'Round the Red Lamp' (1894); 'The Stark Munro Letters' (1895); 'Exploits of Brigadier Gerard' (1896); 'Rodney Stone' (1896); 'Uncle Bernac' (1897); 'The Tragedy of the Korosko' (1898); 'Songs of Action' (1898); 'A Duet with an Occasional Chorus' (1899); 'The Green Flag and Other Stories' (1900); 'The Great Boer War' (1900); 'Cause and Conduct of the War'; 'The Hound of the Baskervilles' (1902); 'Return of Sherlock Holmes' (1904). He has also written the plays, 'A Story of Waterloo' (1894); 'Halves' (1899); etc. He was knighted in 1902.

Doyle, C. W., American physician and author: b. Landour, India, 29 Aug. 1852; d. Santa Cruz, Cal., 1903. He was educated at Calcutta University, studying medicine in London, Edinburgh, and Aberdeen. He was graduated from the latter in 1875, and practised in England till 1888, when he went to California, continuing his practice there. He has published much verse and prose in the magazines, and the volumes 'The Taming of the Jungle' (1889); 'The Shadow of Quong Lung' (1899).

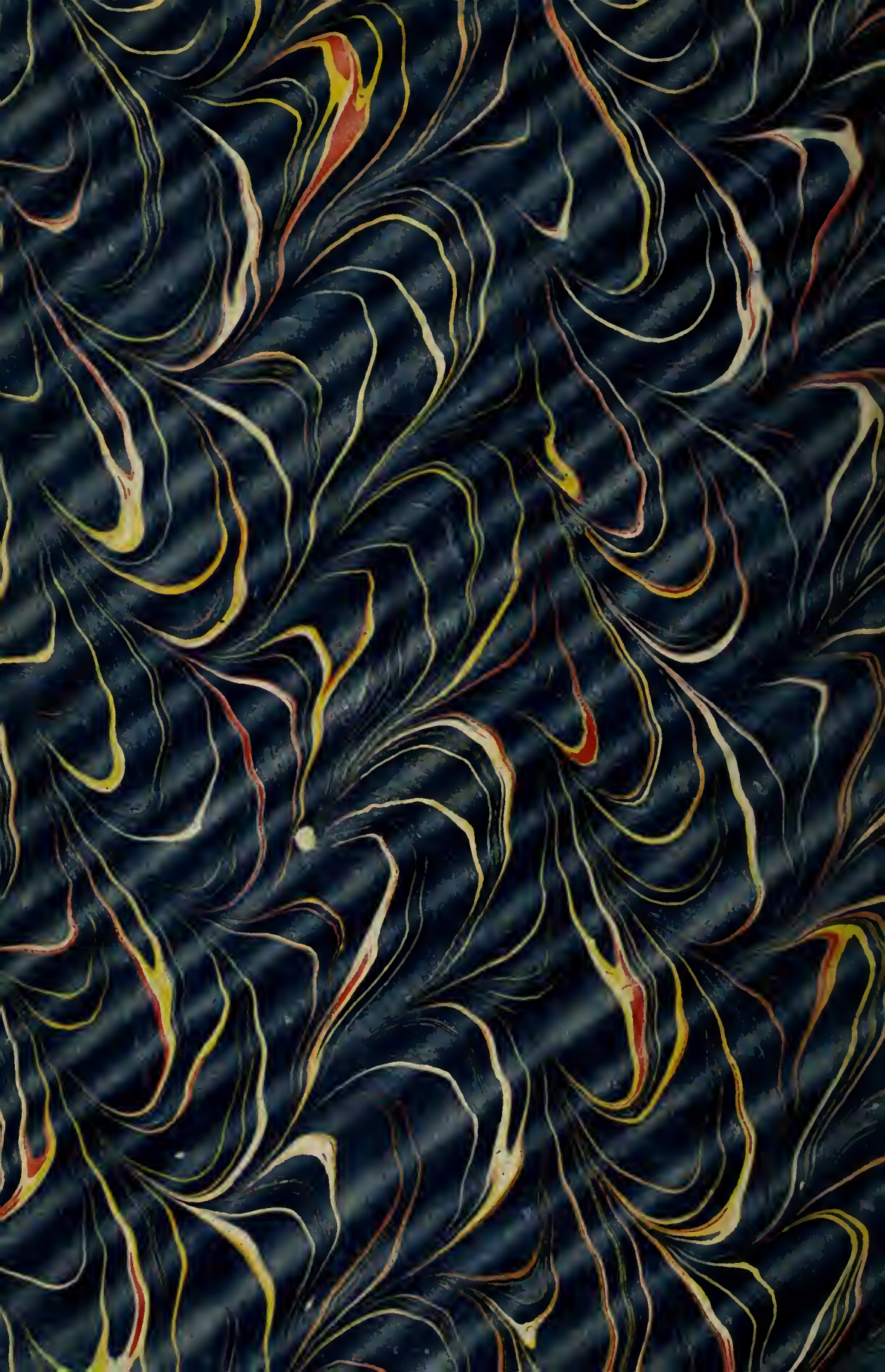
Doyle, Sir Francis Hastings Charles, English poet: b. Nunappleton 1810; d. 8 June 1888. He was educated at Eton and Oxford, held the post of receiver-general and next of commissioner of customs, and in 1867 he was elected to the chair of poetry in Oxford University for the term of five years, being then elected for a second term of the same duration. He had already published 'Miscellaneous Verses' (1841); 'Two Destinies' (1844); 'The Return of the Guards and other Poems' (1866); and he subsequently published his Oxford lectures (1869 and 1877), and 'Reminiscences and Opinions 1813–85' (1886).

Doyle, John, English caricature artist: b. Dublin 1797; d. 2 Jan. 1868. After studying art in his native city he went to London in 1821, and produced a series of caricatures which became famous as the "H. B." caricatures from the initials attached to them, the identity of the artist remaining unknown. From 1829 to 1851 all the politicians of note were in this way gently and cleverly satirized, always within the limits of good taste and gentlemanly feeling. These works, which were executed by means of lithography, appeared in sets of four or five at a time, and ultimately the plates amounted to over 900 in number.

Doyle, John Andrew, English historian: b. 14 May 1844. He was educated at Eton and Balliol College, Oxford. He has published 'The American Colonies' (1869); 'A History of the United States' (1875); 'The English in America,' Vol. I.; 'Virginia, Maryland and the Carolinas' (1882), Vol. II.; 'The Puritan Colonies' (1887).

Doyle, Richard, English artist: b. London Sept. 1826; d. there 11 Dec. 1883. His father, John Doyle (q.v.), the author of the celebrated "H. B." caricatures, initiated him into the mysteries of his art, and the young draughtsman became one of the founder-illustrators of 'Punch,' the current design on the cover of which was invented by him. His sketches of the 'Manners and Customs of ye English' in that periodical, and the 'Bird's-eye Views of Society' in the early pages of the 'Cornhill Magazine,' illustrate the mode of life and manners of London men and women of his time with rare felicity and fidelity. In 1850 he severed his connection with 'Punch' on account of its frequent attacks on the Pope and Doyle's co-religionists, the Roman Catholics. From that time he contributed many illustrations to books. His water-color pictures of fairy lore are well known.

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